SCIENTIFIC AMERICAN

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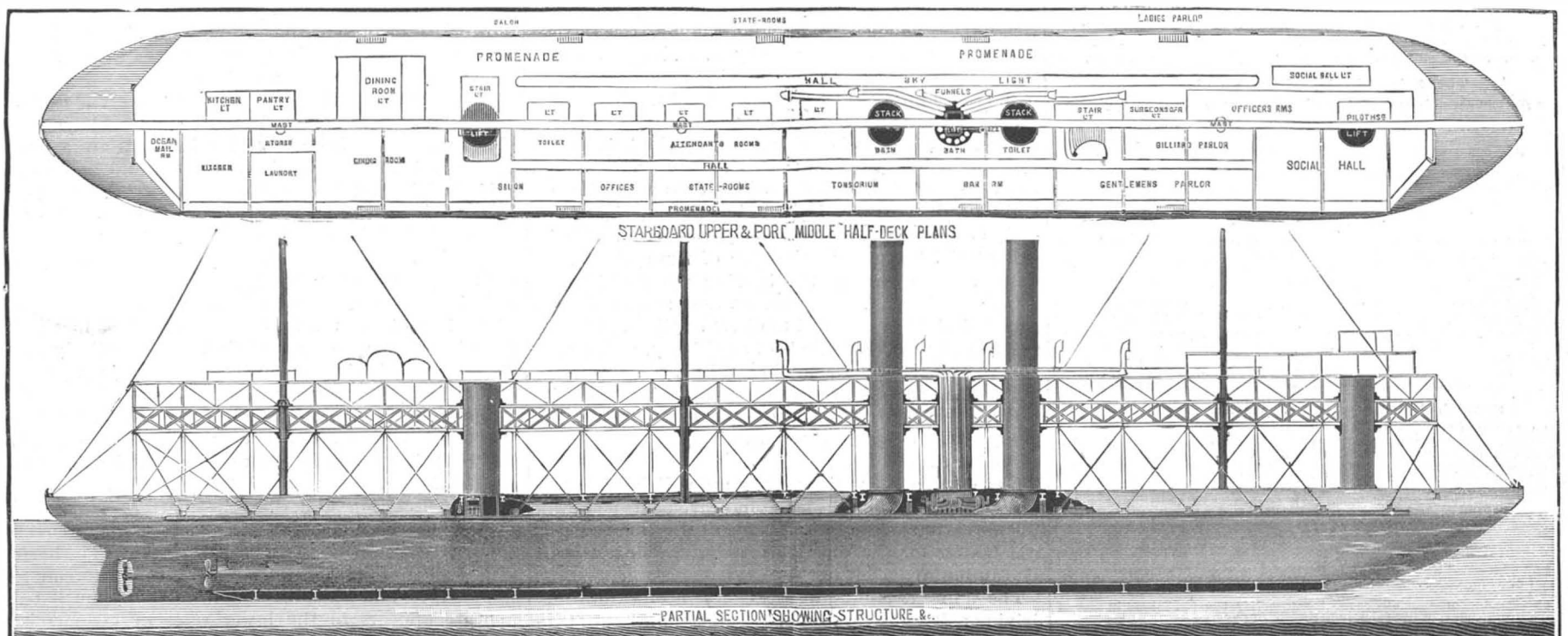

A WHALEBACK PASSENGER STEAMER—DESIGNED BY HAROLD AVERY.—[See page 309.]

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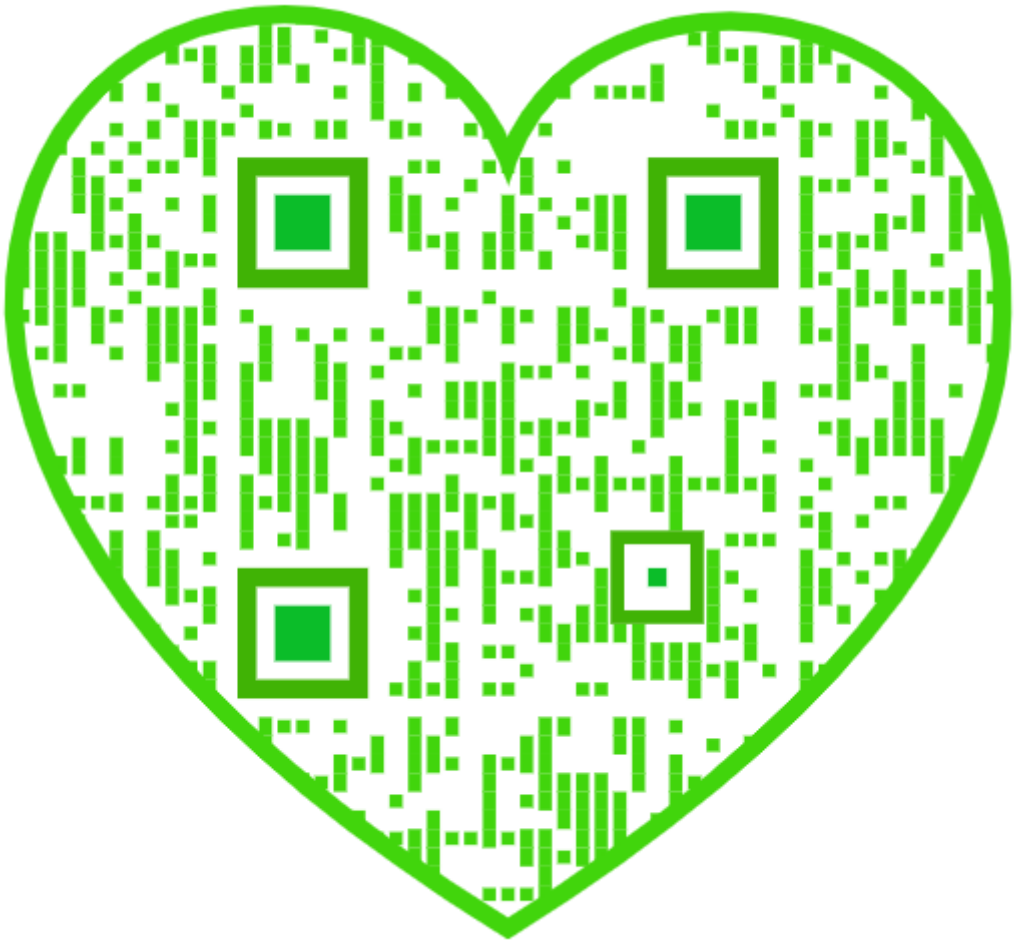

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NEW YORK, SATURDAY, NOVEMBER 14, 1891.

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AMERICAN INSTITUTE FAIR.

The fair of the American Institute, which is now in full blast, presents a very creditable array of exhibits, but it shows no marked improvement over the exhibitions of former years. In the great city of New York and the surrounding manufacturing towns, there ought to be sufficient material for an exhibition greatly superior to the present show. What is wanted is a fair exhibition of the manufacturing products of this city and vicinity. Few novelties are presented; from year to year we notice practically the same exhibits of steam engines and accessories, electric lighting apparatus, wood working and iron working machinery, and manufactures in general.

Among the exhibits of steam machinery we notice the Payne Tandem Compound Engine, the vertical and horizontal engines, made by B. W. Payne & Sons, New York. They are constructed on scientific principles and appear to be rendering good service.

A novelty in steam engines is the compact, self-contained, well balanced engine made by the I. P. Chase Engine Company, of New Britain, Conn. This engine has an oscillating cylinder which does not swing on trunnions in the usual fashion, but the exterior of the body of cylinder is in the form of a cylinder with its axis at right angles to the bore of the cylinder, the outer surface forming the bearing upon which the cylinder swings. These engines are so small and compact as to be well adapted to direct application to line shafts, and to various kinds of machinery, such as dynamos and other high speed machines.

The Woodbury Automatic Steam Engine, made by Stearns Manufacturing Co., of Erie, Pa., is shown. It is especially adapted for work requiring high speed and close regulation.

Gas engines of various types are well represented. The Otto embodying the latest improvements is shown. We notice in this engine the substitution of the electric igniter for the old flame-carrying slide; there is also an improvement in the governor.

The White & Middleton gas engine is on exhibition, driving a dynamo supplying its full complement of incandescent electric lights. This engine has a very sensitive and simple governor. The piston receives an impulse at every stroke, except when the explosive charge is intermitted by the governor. The builders claim great economy in the use of gas, the consumption being stated at a small fraction over 19 cubic feet per brake horse power per hour.

The Daimler Gas and Petroleum Motor, illustrated not long since in our pages, is shown detached and also in connection with a small boat. This engine is adapted to both gas and naphtha vapor. We understand the application of this motor to boats has been very successful. Two forms of the Hartig gas engine are shown.

The Priestman Standard Oil Engine is exhibited for the first time; the one here in use driving an electric light plant and a large rotary pump is 6 horse power. The fuel used is refined petroleum or kerosene oil. The cost of working the engine is about one cent per horse power per hour. This engine has been adapted to the propulsion of boats, and is largely used as a motive power for driving machinery of all sorts in Europe, and we understand it is being rapidly introduced here.

The Otis Electric Pump presents some novel features. It is provided with two pistons, which are driven with a variable motion in such a manner as to cause a continuous flow of water through the pump, the movement of the pistons being alternately quick and slow, one piston making its rapid motion while the other is making its slow movement. This movement of the pistons is effected by a novel arrangement of the crank and a pair of rock shafts and connecting rods. The pump is driven by an electric motor, and is entirely automatic, stopping when the tank is full and starting when the water is low.

The E. & H. T. Anthony Co. have a fine exhibit of photographic apparatus, embodying all the latest improvements. The Scovill Manufacturing Co. have a creditable exhibit, in which are found some of the newer forms of hand cameras.

The Garvin Machine Co. have a fine exhibit of iron working machinery, and the Glen Cove Machine Co. show a variety of woodworking machines especially adapted to rapid, first class work.

The Pyrogravure Wood Co., of this city, have an artistic pavilion constructed of wood carved, or rather embossed, according to their method. The wood is ornamented by means of embossing dies, which are worked at a sufficiently high temperature to char the surfaces which contact with the dies, leaving the other surfaces of the natural color. The work done by this company is very fine, and some beautiful effects are shown in wainscoting, floors, mouldings, and furniture.

The National Embossing Machine Company, of this city, show a machine in operation, embossing mouldings by means of hot rotary dies. According to this method, mouldings equal to the finest carved work are produced readily and economically.

The building is lighted, as heretofore, by arc lights supplied with a current from several United States dynamos, and with incandescent lights operated by Mather dynamos. Among the interesting features in the way of lighting is the Clark search light, made by the Clark Electric Company, of this city. The light is mounted upon an elevated platform, and its brilliant beam is thrown into the dark corners of the building and upon groups here and there, evidently creating much interest in this particular method of illumination.

Docking Horses' Tails.

Fashion seems to have performed a complete revolution in its orbit and has brought in once more in full force the cruel and absurd practice of docking horses' tails. Just at present the custom is in full force, and the unfortunate animals appear with the shortest possible tails. As a question of beauty, it must be conceded that there is a loss instead of a gain. The horse's glory, like that of woman, is in his hair, The abbreviated representatives of the flowing tails are a poor apology for the sweeping locks that should grace the animal. The proportions of the members are destroyed by removing the tail. It throws the horse out of balance so that his long neck and heavy head seem out of proportion. It produces the effect of the horse pitching forward on his nose. The animal when docked looks harmonious from no point of view.

The loss of the tail as a weapon against flies and other insects that so torment the horse, peculiarly sensitive in his skin, is one of the greatest injuries done him in the docking process. Again, however humanely the process of amputation can be conducted, it is certain that it is generally an occasion of great cruelty, and that ignorance is the cause of the infliction of great suffering.

One consolation underlies the matter. It is that fashion is perpetually changing and that a new generation of horses may be spared the infliction. The horse with docked tail, as he grows old, will descend to ignoble uses, and when the once fashionably mutilated creature appears in the lower roles of commercial work, the cultured rider may be willing to accept nature as the exponent of beauty unadorned.

New York Pasteur Institute.

Dr. Paul Gibier, director of the New York Pasteur Institute, in his half yearly report (February 18, 1891, to August 18, 1891) says 415 persons applied for treatment.

In the case of 345 of these persons it was demonstrated that the animals attacking them were not mad. Consequently the patients were sent back after having had their wounds attended to during the proper length of time.

In 70 cases the anti-hydrophobic treatment was applied, hydrophobia of the animals inflicting bites having been evidenced clinically, or by inoculation at the laboratory, and in many cases by the death of some other persons or animals bitten by the same dogs.

One death after treatment is reported, namely, a child five years old, of South Framingham, Mass. Badly bitten in nineteen places by a dog recognized to be mad. Treated from July 15 to August 1. Symptoms of hydrophobia appeared six days later.

Three other persons (two sisters of the patient and a man) bitten by the same dog, who received the same course of treatment, are now enjoying good health.

Kite Electricity.

The most important recent experiment regarding atmospheric electricity in England, carried out by Mr. Alexander McAdie, seems to take one back to the very infancy of electrical science; for, though the conditions were somewhat different, the operation was substantially identical with Benjamin Franklin's historical experiment with the kite. What Mr. McAdie has demonstrated is that electricity can be drawn from a kite high in the air in a cloudless sky. The kite, Mr. McAdie states, discharged sparks from the lower end of an insulating wire reaching to the earth, where an electrometer partly measured the increasing electric force. So nearly did the quantity of electricity in the upper air correspond to the height of the kite above the earth that the experimenter could usually determine whether the kite was rising or falling by simply looking at the needle of the electrometer. This is an experiment that almost any of our young electricians may easily try, and they will find it very interesting.

Trade Mark—Form of Package.

According to the decision of the Supreme Court of Pennsylvania, in the case of Hoyt et al. vs. Hoyt et. al., the size, shape, or mode of construction of a box, barrel, bottle, or package into which goods may be put is not a trade mark, and if a manufacturer has a right to use a certain label, he may use it on any kind of bottle that is not patented, and he will not be restrained from combining his own label with a particular shape or style of bottle for the mere reason that the latter had been previously adopted by some other producer of similar goods.

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A Perfect Electric Motor.*

BY H. A. EVERETT.

In his report upon "A Perfect Electric Motor," Mr. Everett gave a brief history of the electric motor, its imperfections, and the steps taken to overcome them, and, after bringing the subject down to date and discussing the usages of various railways, summed up his idea of a perfect motor as follows :

Taking the trolley wheel, pole, and stand, I think it desirable to have a wheel that is capable of following the wire at any angle, with a trolley pole brittle enough to break should it become entangled in the wires, without pulling them down, and a trolley spring rigid enough to give good, steady pressure on trolley wire, and so constructed that when the car is in the car house or going under a low bridge, the pole could come very close to the roof of the car, also flexible enough to give good pressure when the trolley has to be 21 or 22 feet high at the railway crossings.

The car should have a lamp circuit, with plenty of lamps distributed properly.

The perfect motor ought to have, as hereinbefore suggested, a reliable fuse plug, that will invariably blow before injury is done to the machine.

Have on each car the best lighting arrester that can be secured in the market.

In coming to the motor proper, it is desirable to use a controlling switch that is easily operated and readily reversed, in case of accidents. The simpler the controlling device the better, and it should be constructed with a view to guard against any possible disarrangement of the parts, so that it will be reliable in all cases, both electrically and mechanically.

The rheostat should also be carefully looked after, and properly protected to keep it from injury, by reason of water, snow, or dirt getting upon it. It should only be available in starting the car to avoid the lunge of a start, and should be so arranged as to be cut out as soon as the car is started, and give the entire efficiency of the motor proper.

The motor should be well protected in all its parts from any outside interference, so that in running along the street it will be impossible to pick up nails, wire, or anything that would short-circuit it, at the same time observing that a motor must be properly ventilated to keep it from heating while in use. The cover should be made so as to be readily removed.

I deem it very advisable to have an armature of a large diameter, making a small number of revolutions per minute, with the bearings made of extreme width with proper grease cups, and in such a condition that they can be readily re-babbitted when slightly worn.

The diameter of the commutator should also be large, and to have the brushes easy of access is very desirable. The winding of the armature ought to be of the simplest kind, and the size of the wire and insulation of same should be carefully looked after. I think the insulation of wires in armatures is at present one of the weakest points in the motor.

The armature gears should have a wide face, and run in oil. The armature shaft ought to be of ample diameter, and there is nothing gained by having the keyway too small for the securing of the commutator to the shaft. The commutator should be carefully insulated, so that there will be no grounds between it and the case. The box in which this gear runs ought to be constructed of copper, or some light material that is somewhat flexible, so that if struck from the outside it will bend rather than break. The fields should also be wound with a wire of better insulation, and of ample size to take the current. Of course, in this particular, I do not intend that the wire of either the field or armature should be great enough to take more horse power than ought to be used by the machine. To my mind it is very desirable to have the armature in such a condition that it can be readily taken out from the machine and put in again.

One of the serious disadvantages to operators of electric roads is the expensive labor necessary in winding the armatures and fields, also in regard to high-priced mechanics who ought to be employed to attend to the machines. There is nothing gained in employing a cheap class of labor to handle an electric equipment either as electricians, armature or field men, or mechanics. This proposition is a self-evident truth, as can readily be observed in many roads now in operation.

At present, I think the single-reduction motor is the nearest perfection of any on the market

I think it very desirable that the electric companies should devote some time to the perfection of an electric brake to stop the car with the same power that runs it. This could be readily done, and would be a satisfactory improvement.

Electric heaters are now used in quite a number of places, and I think will prove quite satisfactory.

I have noticed electric signal bells on some of the cars, and they seem to work very well.

For a dasher gong on a motor car I am in favor of a foot tread, as in testing an electric gong we found that our men used it altogether too freely.

I am in favor of an oil head-light, one that can be removed easily, so that in the event of a trolley being broken or anything happening to the electric part of the car, or a light is desired underneath the car, the oil head-light can be used to better advantage than the electric. There ought also to be one oil light in every car for the same purpose. There is no reason why an electric fare register cannot be made to work successfully.

The durability of a motor is a question which requires very careful attention. The single reduction motor, when properly looked after, ought to last for many years. We have had one in operation for over ten months, and it appears to be in as good condition as when it first went on the road. The car should be of moderate size, constructed with all modern convenience, but without fancy decorations or any unnecessary display.

The cars should be run on frequent headway, and at all hours of the day and night, at as high a rate of speed as the civic authorities will permit. The noise of the motors has been very largely done away with, and by careful attention the old countershaft machines can be used until worn out by simply covering the gearing with an oil box, and by not attempting to run them too many miles without inspection.

* Abstract of a report presented to the American Street Railway Association, at Pittsburg, Oct., 1891.

Engineering at the Fair.

Among the series of congresses to be assembled at Chicago during the exposition season of 1893, engineering will have an important place.

The Department of Engineering includes the construction of railways, canals, and tunnels; river and harbor improvements and waterworks; sewerage and drainage; bridges and other structures; also mechanical, mining, metallurgical, military, and naval engineering.

This department is under the charge of a local committee composed of the following gentlemen : Mr. E. L. Corthell, chairman ; Mr. J. D. Whittemore, vice-chairman ; Mr. E. M. Izæd, Mr. William Forsythe, Mr. G. L. Stroble, Mr. Robert W. Hunt, Mr. John W. Cloud, and Mr. Joseph Hirst.

This committee will be assisted by an advisory council, which will be composed of the eminent engineers of the world, through whose co-operation the general international engineering congresses will be assembled.

The following report has been made by Mr. Corthell, the chairman of the general committee, who was appointed by President Bonney as the special commissioner of the World's Congress Auxiliary abroad :

CHICAGO, October 5, 1891.

HON. C. C. BONNEY :

DEAR SIR : I have just returned from Europe, where I have been engaged during the last four months in making examinations of railroads, railroad terminals, harbors, universities, and technical schools; also in inviting, personally and by letters, the engineers of Europe to the international engineering congress which it is proposed to hold here in 1893 under the auspices of the World's Congress Auxiliary. My professional intercourse with many eminent engineers gave me a good opportunity, whenever I met them, to explain the object and the scope of the congress. The position as chairman of the general committee of the World's Congress Auxiliary on engineering congresses, and that of chairman of the executive committee of the general committee of the engineering societies of the United States and Canada, enabled me to bring this subject in an official manner before engineers and before their various associations. I invited, personally and by letter, thirty-six engineering associations. Although most of the associations were in vacation from June to October, yet I have received from many of the secretaries, and personally from several of the presidents and other members of their councils, not only an assurance that their associations would accept the invitation to participate in the congress, but also expressions of the great interest which these important associations of engineers have in the proposed congress. Not only the engineers composing these associations, but the engineers of the governments especially of France, Germany, Holland, and Belgium, evinced the greatest interest in our congress. The interest in the congress among the engineers of Great Britain and the officers of the great engineering societies of that country was not less than that shown on the Continent, and I received here also promise of support for our congress, and the expression of a desire to attend it which was universal. I might say here that in all the countries which I have visited, nearly all the engineers whom I met promptly signified their intention of coming to the congress and the Exposition. By invitation I attended the annual convention of the Mechanical Engineering Society of Germany, held at Dusseldorf. This society numbers about 6,000 members, the council of which decided to accept our invitations to take part in the congress. I was also informed by the president of the Society of Civil Engineers and Architects of Germany, which numbers about 6,000, that they had acted on the invitation and had gladly accepted it. Letters have been received also from engineering societies in countries which I was not able to visit, expressing a great interest in the proposed congress, and assuring me that their councils would act upon the matter immediately after their vacation.

There has been received also a communication from the president of the Mexican Association of Engineers and Architects, with the information that the association is glad to accept our invitation and that it will send delegates to the congress. It is proper for me to state that while in Europe I was in communication with the director-general, the superintendent of construction, and the chief engineer, who sent me from time to time information of the progress of the work connected with the Exposition, which enabled me to reliably inform all those whom I met in regard to the progress of the work. You will readily see that I would reach places and people which others might not. It would be premature at this time to give names of those who have been of service to me while abroad, but I can assure you that I have been greatly assisted by members of the engineering profession in all the countries which I visited, and have received assurances from them that they would take up the work where I left it and seek by all means in their power to promote its interests. I am, yours respectfully,

E. L. CORTHELL,
Chairman of General Committee on Engineering Congresses.

Enlargement of Small Photos.

The enlargements upon bromide paper have one defect, a cold tone and quite frequently a certain hardness. One is so used to the gloss and tone of the albumen paper that even on enlargements its want is felt. Now, as is well known, it is not difficult to obtain enlargements upon albumen paper, namely, by enlarging the plate. The small negative is copied in the printing frame and by lamp light upon the same size dry plate, and a positive is thus obtained by development which is sufficiently sharp. This small positive is enlarged in the camera to twice and three times its size, and a negative is thereby obtained which in no way is behind the original, if the latter was sufficiently sharp. The expenses connected with the enlargement are essentially restricted to the price of the dry plate of larger size, besides the original negative and a plate for the positive of it. A great convenience has hereby certainly been gained, particularly for tourists, to use a much smaller apparatus. If a size like 9 by 12 cm. is chosen, pictures will be obtained which even in the original size give a handsome print, sufficient for general purposes. The enlargements should not be made from all plates, but only the best and most interesting should be selected. A good lens is, of course, necessary for such enlargements.

Still another method of negative enlargement I would like to mention here, which is much simpler, but permits only enlargements of one-third the size. This method is already known, but has been applied very little. The glass negative is laid in fluoric acid diluted from one hundred to one hundred and fifty times. The film can be stripped very soon and is put in water and washed thoroughly. In the water the film will stretch to one-third of its length and width ; 3¼ by 4½ will then be 4½ by 6 ; 5 by 7 will increase to 6⅔ by 9⅓. In this manner an enlargement is obtained in the simplest way. If the method has been applied so little, the reason is only in the fear of handling the fluoric acid. True enough, this is very dangerous in concentrated condition on account of its etching properties, but diluted it is harmless.—*Dr. H. W. Vogel, Anthony's Bulletin.*

The New Italian Rifle.

The weapon is 1·2 meters long, exclusive of the bayonet ; and of 6·5 millimeters caliber. The most important factor in connection with the rifle is the smokeless powder cartridge, which, owing to its light weight and small size, permits the number of cartridges carried by the soldier to be augmented to 160. The initial velocity of the bullet is 720 meters per second, and with regard to its penetrative force, it is said that the ball will pierce two mattresses and two planks 12 centimeters (5 inches) thick, at a distance of 1,200 meters, or 4,000 feet. Loading is effected by means of magazines containing five cartridges so arranged that a repeating fire may be maintained until the magazine is exhausted. A few experts who witnessed the experiments assert that the new rifle is too short ; but the majority were convinced that the weapon is the best and most destructive at present existing among European armies.

Car Fire from Electric Light.

A car of the Great Northern, of England, is supposed to have taken fire from the electric lighting wires with which it was equipped. The accident occurred the last week in August. The cars are lighted by electricity, the current being supplied by a dynamo in the rear guard's van. Flames were discovered issuing from the chamber in which the dynamo stands. The train was stopped and the fire quickly extinguished. It is supposed that the fire was set by defective insulation.

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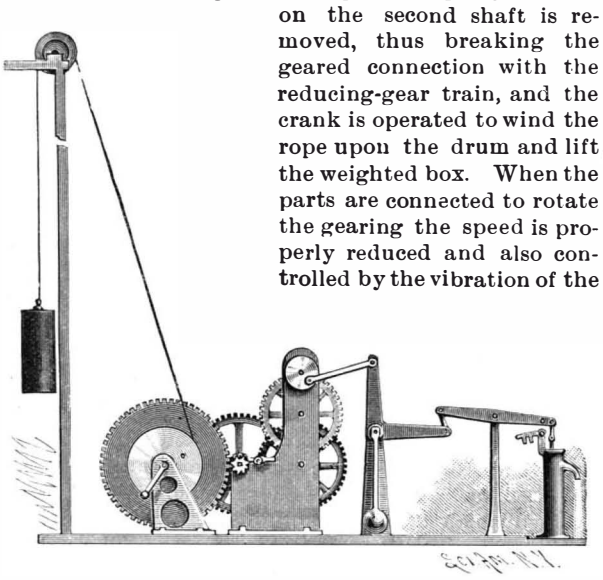
A SIMPLE MECHANICAL MOTOR.

The illustration represents a device, patented by Mr. Charles C. Henderson, whereby power may be stored for subsequent use to pump water, or for other service, the motor being also a useful adjunct to a windmill, furnishing power when the mill does not run. The motor mechanism is supported by three bracket stands upon a suitable base, a transverse main shaft carrying a drum and master wheel, while a second shaft, adapted to be operated by a crank, carries a pinion whose teeth engage those of the master wheel. A large, loose spur wheel on the shaft by the pinion is adapted to be secured to the shaft by a pin, and to the rear of this shaft is a countershaft having a small pinion engaging the spur wheel. Adjacent to the pinion on the countershaft is a larger gear wheel meshing with a pinion on a cross-shaft journaled higher up in the standards, this shaft carrying a spur-wheel engaging a pinion on a crank-shaft having at its outer end a crank-disk. A pitman loosely connected to a crank-pin on the disk is also connected to a bell-crank rock-arm carrying a pendulum rod, the arm being also connected by a short link with the walking beam of a pump. A rope attached to the drum extends up over a pulley mounted at the top of a derrick, a weight or a box containing heavy material being attached to the free end of the rope, the amount of the weight being sufficient to cause a proper movement of the gearing and the working of the pump plunger. When power is to be stored, the pin securing the large spur-wheel on the second shaft is removed, thus breaking the geared connection with the reducing-gear train, and the crank is operated to wind the rope upon the drum and lift the weighted box. When the parts are connected to rotate the gearing the speed is properly reduced and also controlled by the vibration of the pendulum, which is made adjustable to suit the size of the pump and the length of the stroke. To stop the motion of the pump at any time a latching dog is provided, which may be hooked to a pin on the walking beam.



HENDERSON'S MOTOR FOR DRIVING PUMPS.

Further information relative to this improvement may be obtained of the Henderson-Maddock Motor Co., Goldendale, Washington.

The Glow Worm Caves of Tasmania.

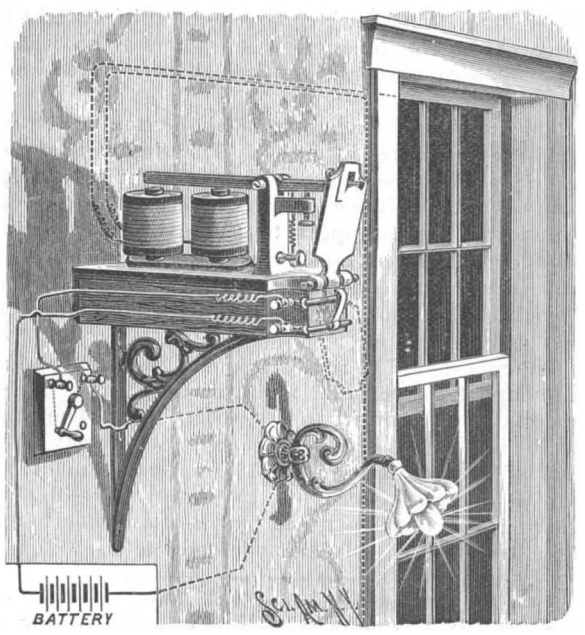
At the meeting of the Royal Society of Tasmania in June, an account of some fine caves that have been discovered near Southport, Tasmania, was given by Mr. Morton, who had visited them. They are situated about four miles from Ida Bay, and a fairly good road leads to them. The entrance is through a limestone formation. A strong stream flows along the floor of the chambers. The first chamber reached by Mr. Morton and those who accompanied him showed some fine stalactites, and along the floor some fine stalagmites were seen. On the lights carried by the party being extinguished, the ceiling and sides of the caves seemed studded with diamonds, an effect due to millions of glow worms hanging to the sides of the walls and from the ceilings. Further on, several chambers were explored, each revealing grander sights.

The time at disposal being limited, the party had to return after traversing a distance of about three-quarters of a mile, but from what was observed the caves evidently extended a distance of three or four miles. The only living creatures seen were the glow worms. These caves, under proper supervision, should become, Mr. Morton thinks, one of the great attractions of the south of Tasmania.

AN electric ventilator for supplying a building with fresh air, either cold or warmed, as desired, is so arranged that the electric motor sets the ventilator revolving, which sucks cool air in. When warm air is desired, a current is sent into a network of fine wire possessing a high resistance, and through the network the air is obliged to pass; the current heats the wires and the air becomes heated. The movement of a commutator is sufficient to change the character of the air supplied by the ventilator. This system is capable of considerable adaptation, and it is stated that the hygienic results are uniformly good.

AN ANNUNCIATOR FOR BURGLAR ALARMS, ETC.

A circuit-closing attachment for annunciators, by means of which an electric lamp will be lit when the annunciator drop falls, is shown in the illustration.



FOUTS' ANNUNCIATOR.

It has been patented by Mr. Lambert F. Fouts, of Trinity Mills, Texas. In a standard projecting from the base plate on which the electro-magnet is mounted is fulcrumed an armature lever, extending over the magnet and through a mortise in the annunciator drop. The drop is pivoted to incline slightly forward, and so that it will fall by gravity when released from the catch on the outer end of the armature lever, which is held down and normally out of contact with the magnet by a spring. Supported within the path of the drop, as it falls when released by the catch, is a contact spring attached to one of the wires in a circuit in which is included, as shown, a battery, an electric lamp, and a switch. The improvement is designed for use in a burglar alarm or other signal system, and the circuit-closing devices and battery are connected with the terminal wires of the magnet in the usual way, so that when a sufficient current is thrown upon the magnet by the opening of a window or door, the armature lever is tilted to release the drop, which in falling strikes the contact spring, as shown in dotted lines, closing the circuit and causing the lamp to become luminous. The lamp is afterward extinguished by opening the switch.

AN IMPROVED STALK CUTTING MACHINE.

The illustration represents a machine patented by Mr. Robert N. Brownlee, and especially adapted for cutting cotton stalks or corn stalks, and other similar field work. The main frame, pivoted to the axle, is preferably held to incline slightly forward from the vertical, and is kept in an approximately fixed position by a rod extending from the front of the frame to an eye on the tongue. Two vertical shafts are carried by the frame, a bevel pinion on one of the shafts meshing with a large gear wheel on the axle, while the upper end of this shaft carries a gear wheel meshing with a pinion on the other shaft, which carries a series of saws arranged one above the other. The shafts are revolved by the revolution of the axle as the machine is moved, and both shafts are provided with rods designed to swing the stalks inward in position to be cut by the saws, guides being also provided to carry the stalks against the saws as the machine is drawn along. Secured to the tongue adjacent to one side of the frame is a rack, the teeth of which are engaged by a pin sliding in a keeper on the frame, whereby the incline of the frame may be accurately fixed. Any desired number of saws may be arranged on the saw shaft, according as the stalks are to be cut into finer or coarser pieces, the tops of the stalks being first engaged by the upper saws, and each succeeding saw cutting them off in course.

BROWNLEE'S STALK CUTTER.

Further information relative to this invention may be obtained of Messrs. Brownlee & House, Bend, Texas.

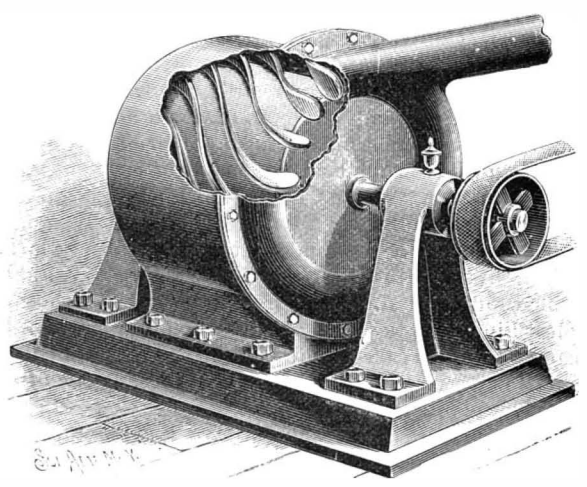
The Martinique Cyclone.

Respecting the destructive cyclone which visited Martinique on the 28th of August last, *La Nature* says: The curve of a Richard barograph shows that the barometer commenced to fall about 2 P. M., when it stood at 29·92 inches, while between 7 and 8 P. M. it fell from 29·72 inches to 28·70 inches. The wind at this time, too, reached its greatest violence, and continued with hurricane force for several hours, passing alternately from northeast to south. The recovery of the barometric pressure was equally rapid, the reading being about 29·70 inches before 10 P. M. M. Sully, of Saint Pierre, writes that the lightning was constant, with varying intensity before and after the passage of the center. The sound of the thunder was scarcely perceptible, owing to the howling of the wind and the noise caused by the falling roofs and houses. Globular lightning was seen on all sides during the hurricane; the country folks speak of globes of fire which traversed the air for several minutes, and burst about two feet above the ground. All the towns and villages were greatly damaged, the crops destroyed, and that usually verdant country presented the appearance of the depth of the most severe winter. The deaths are said to be 420 in number.

The Martinique hurricane, it appears, moved west-northwest along a somewhat irregular track, crossing over Puerto Rico, Turk's Island, Crooked Island, and lower Florida, finally dying out in the northeastern gulf.

AN IMPROVED VENTILATOR OR BLOWER.

The illustration represents a blower of simple and durable construction, designed to be very effective in operation for readily exhausting foul air, gases, etc., from rooms, or for forcing or pumping air or liquids to any desired place. The wheel within the casing has a cylindrical drum on the periphery of which are secured helicoidal wings or blades extending beyond the face of the drum into an annular chamber on the rear end of the casing, to close the latter at this end, the front end of the casing being open. The cross section of the annular chamber is preferably semi-spherical, and the ends of the blades or wings are semicircular, to fit into the chamber, from which leads an outlet pipe. The blades are preferably made of steel, copper, or like material, to be sufficiently elastic to vibrate when the machine is at work, when the air or other material is drawn into the open end of the casing by the action of the helicoidal wings, whose shape is designed to give an increasing velocity to the fluid until it reaches the point of discharge in the annular chamber, where it is forced into the outlet pipe by the extended semicircular ends of the blades. When the machine is to be used as a pump, the open end of the casing is closed and connected with a suction pipe.



LAFITE'S VENTILATOR OR BLOWER.

Further information relative to this improvement may be obtained by addressing the inventor and patentee, Mr. Emile G. Lafite, in care of Messrs. Brooks & Co., Santiago, Cuba.

Car Lighting.

At a recent meeting of the New England Railroad Club the subject of debate was the lighting of railroad cars. The drift of opinion seemed to be that mineral oil lamps, with oil at 300° fire test, furnished the most brilliant, safe, and economical light. Cost to equip a car with five Sherburn lamps, $165. Next to this came the compressed gas system—the Pintsch system being the one most extensively used. Cost to equip a car, $400. The gas is carried in tanks under the floor of the car. The compression is from 90 pounds to 225 pounds to the square inch.

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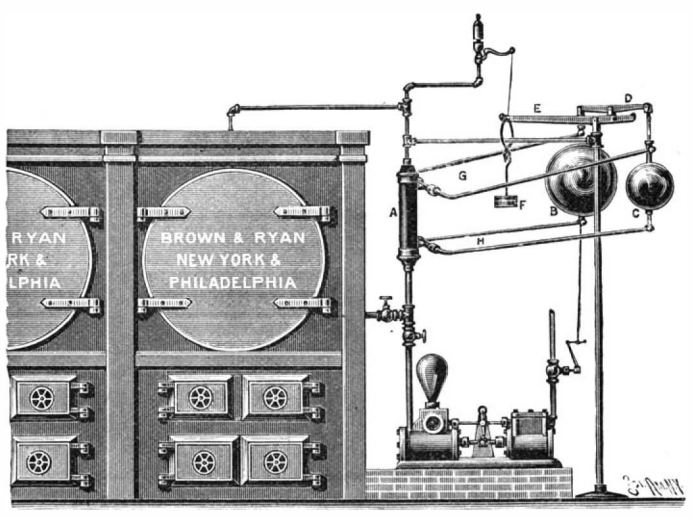
A BOILER FEEDER, REGULATOR, AND ALARM.

This improvement, patented by Mr. P. Brown, is designed to afford absolute safety against danger from low and high water in boilers. It has no floats to clog or fill and no springs to weaken or break, and is without delicate valves or pistons, while, in case of the water supply being cut off from any cause, an alarm is given before the water level falls to the danger point. A vertical cylinder, A, is connected above and below with the steam and water spaces of the boiler, and this cylinder is connected at different elevations by the four flexibly jointed pipes, G, H, with the two spherical vessels, B, C, suspended from the beam, D, fulcrumed near the end of another beam, E, working on a fixed fulcrum. The larger spherical vessel, B, will be about half full of water when the water in the boiler is at a medium height, the smaller spherical vessel, C, being then full of water. By the fall of the water in the boiler the vessel, B, is emptied, the water being displaced by the steam, and the beam, D, is then drawn down by the vessel, C, when, by means of crank and lever connections, the pump or injector is set at work to renew the supply of water in the boiler. When the water reaches the highest point desired, it fills the larger vessel, B, and the beam, D, is again moved to cut off the supply. When the water reaches so low a level that both cylinders are emptied, the connections being such that this will take place before the water drops to the danger level, then a weight, F, on the other end of the beam, E, tips this beam, and, by a wire and chain connection, a whistle or electric alarm is sounded. This apparatus may be arranged in any part of the boiler room where it is most out of the way, but the illustration represents a practical application of the improvement, as adapted to the steam plant of a large manufacturing concern. The equilibrium of condition maintained by the two vessels suspended from the compound lever, and connected to the water column by the flexibly jointed pipes, is such as to permanently secure a very nearly uniform water level, of not more than three-quarters of an inch variation, the alarm being liable to be called into use only in case of some accident or unforeseen stoppage of the water supply.

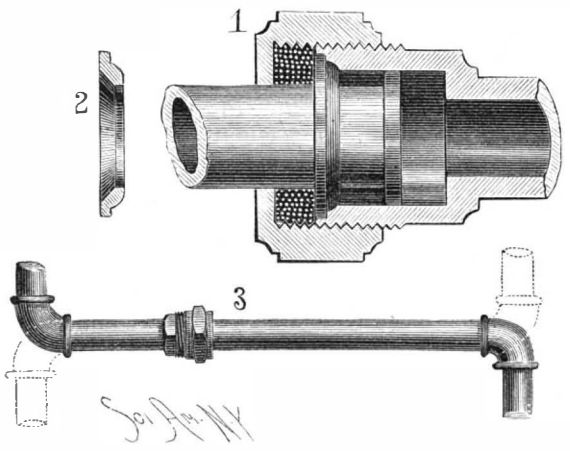
Messrs. Brown & Ryan, of No. 120 Liberty Street, New York, or No. 49 North Seventh Street, Philadelphia, will be pleased to furnish any further information desired relative to this invention.



BROWN'S AUTOMATIC BOILER FEEDER, REGULATOR, AND ALARM.

AN IMPROVED PIPE JOINT.

The improvement which forms the subject of the accompanying illustration is applicable to steam, water, oil and other pipes, affording great convenience in adjusting the pipes and preventing breakage or leaking from their expansion and contraction with changes of temperature. It has been patented by Mr. P. Brown, of Philadelphia. Fig. 1 shows the joint-piece or coupling, partly in section, uniting two ends of pipe, Fig. 2 showing a washer used in the joint. One pipe, as will be seen, has on its inner connecting end an external flange, fitting within and free to move in or out in a circular inclosed box part or chamber at the connecting end of the adjacent pipe, and also to rotate axially therein. The chambered portion of the adjacent pipe is externally screw-threaded, and has a beveled or concave seat in its face end, in which fits a washer loosely placed upon the other pipe back of the flange, and back of this washer is placed a packing, preferably of asbestos. The packing and the washer are both inclosed by an internally threaded nut which engages with the screw thread on the chambered end, the nut having an inner projecting back flange that closely hugs the body of the pipe back of the packing. By screwing up the nut to bring the washer in front of the packing up against its seat a tight joint is secured for the meeting end portions of the pipes, both peripherally and endwise. As shown in Fig. 3, the connected pipes are arranged for automatic longitudinal adjustment, or contraction and expansion, by means of this joint, while capable of being axially turned as required to change the position of the elbows at their opposite ends, the bore of the pipe being of the same diameter throughout. It is also apparent that this improvement may be advantageously employed in the connections of pipes for car heating, and in the steam or air couplings between the cars, etc.



BROWN'S SWING AND EXTENSION PIPE JOINT.

Further information relative to this invention may be obtained of Messrs. Brown & Ryan, No. 120 Liberty Street, New York, or No. 49 North Seventh Street, Philadelphia, Pa.

Bursting of a Large Fly Wheel.

On the afternoon of September 25 the fly wheel of a 550 horse power engine in the power house of the Cincinnati Street Railroad Company, located at the corner of Reading Road and McMillan Street, Cincinnati, O., broke, and the flying pieces tore their way through the roof and walls, almost cutting the building in twain.

Parts of the wheel, varying in size from five feet in length and four feet wide, weighing 800 pounds, to the merest fragment, were found 1,000 feet from the building. One massive section, weighing 1,200 or 1,500 pounds, was hurled through the roof and fell 500 feet to the northward.

The fly wheel was twenty-two feet in diameter, with a fifty-inch face, and weighed 50,000 pounds. The rim was two inches thick. It was attached to the center engine and revolved on a twelve-inch shaft. In breaking it snapped the spokes near the bearing, and a part of the flying rim struck the receiving pulleys on the main shaft and shattered it, while other parts broke the main pedestal, weighing 4,000 pounds, and the rocker arm which drives the valves leading to the cylinder. The main bearing was also torn out of the stone foundation. The damage to the shafting, belting, and pulleys will probably reach $4,000. Fortunately there was no loss of life.

IN using the heavier grades of kerosene or refined petroleum oils in lamps, the wick often becomes charred at the top, which obstructs the capillary action of the wick. When the wick is raised, the charred top obstructs the slot in the flame guard and diminishes the flame. Wicks should be often renewed. The old wicks become hard and partially obstructed in the tube.

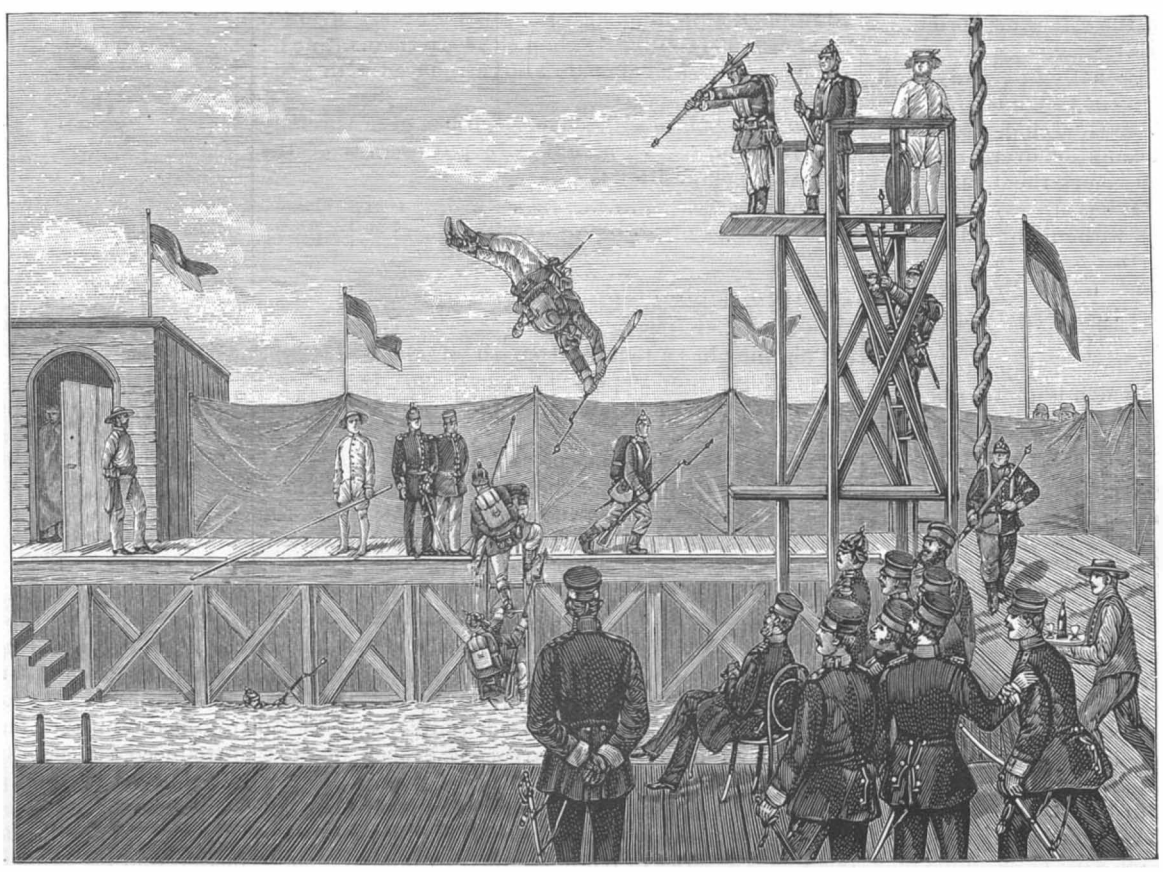
THE GERMAN ARMY SWIMMING EXERCISES.

While the swimming service is obligatory on the pioneers, and lately also on the cavalry, it is optional with the members of the other departments of the army, and the fact that the annual subscription list is always more than full is a pleasant indication of the love of sports among our "Blue Boys." Many an enthusiastic admirer of Neptune must, to his great sorrow, be turned away on account of the great number of applicants.

The instruction is given, under the direction of lieutenants, by under officers. It begins with the regular practice of the swimming strokes, the pupil being supported meanwhile by the so-called "fishing rod." When he has learned the movements well enough to be able to support himself above the water, he begins to swim on a loose line. At this stage it is often found that those for whom the highest hopes had been entertained lack one quality that is indispensable for a good swimmer; we mean that Olympic calm without which the most carefully acquired knowledge of the strokes is useless. When the pupil is able to keep himself on the surface safely and quietly, he must go into the water without the helping line, but a rod is placed a certain distance above his head for use in case of need. After this he must submit to the test of swimming alone for fifteen minutes, then for half an hour, accompanied by a boat, and then comes the "Todtenfahrt" (death trip), which lasts an hour.

The swimming exhibitions held at the end of the summer before the commanders of the battalions or regiments are pleasant festivals and those held in Berlin or Potsdam are often attended by any princes of the reigning house who happen to be in the neighborhood. Classes of men clad only in their swimming tights exhibit their proficiency in swimming, jumping, and diving, and this water exercise in regularly formed lines, squads and sections is a pleasant sight. Lastly comes the most important feature of the programme, the exhibition of the finest swimmers in full marching uniform and with bayoneted guns in their hands. They jump from a high tower into the cool water, on the surface of which these fully armed sons of Mars amuse themselves until the command of the officer in charge calls them from the damp element.

The swimming service of the German army is an excellent institution, for besides giving the men healthy exercise, it tests the courage and self-control of the men in time of peace.—*Illustrirte Zeitung.*



THE GERMAN ARMY SWIMMING EXERCISES.

Iron Contracts for the Fair.

It is announced that the contract for the iron and steel work of Machinery Hall, for the Chicago Exposition, has been awarded to the Cofrode & Saylor Manufacturing Company, of Pottstown, Pa. This structure, including the main building and its annexes, will be the most extensive of the Exposition. It will be 850 feet long and 400 feet wide, the width being covered by three steel arches over 100 feet in height, and the central transept, 130 feet wide, will be surmounted by three domes 250 feet high. The iron and steel will be rolled at the Reading Rolling Mill, but the fabricating and fitting will be done at Pottstown. The whole is to be completed and in place by May, 1892.

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BAD PAVING IN NEW YORK.

Broadway, the great thoroughfare of New York, for the past two months has been practically closed to vehicles, by reason of its occupation by the street railroad company in laying down the required paraphernalia for cable propulsion in place of horses. This job is now nearly completed, and has been executed in the most substantial manner. The city authorities have undertaken to relay the stone pavement between the outer rails of the cable road and the curb stones. We regret to say they have adopted the same old good-for-nothing system which previously existed; to wit, bedding the stone blocks in soft sand. The result is

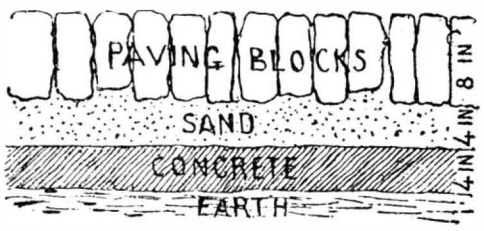


Fig. 1.

the evenness of the pavement only continues for a short time after it is laid down; the stone blocks rise in some places and sink in others, and the general surface takes on an appearance like the waves of a choppy sea. The pavement must then be taken up and relaid. This is a method considered best by the politicians who misgovern the great city. It brings to them a perennial flow of money from the city treasury on which they fatten while the tax payers suffer.

Fig. 1 shows how the pavement looks when it is first laid down. Fig. 2 shows its appearance after it has been in use for a short time.

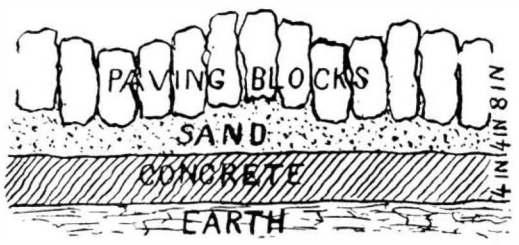


Fig. 2.

A writer in the New York *Tribune* says:

"Why it is possible for this new work to get so quickly out of order is easily explained. The blocks are of all sorts and sizes. They are too roughly cut to make close joints, and, being set in a bed of sand, have no firm foundation.

If the block is a thick one, it is pounded down to the proper level; if it is a thin one, it is left to rest lightly on the sand, so that it will come up to the proper level. Tar is then poured into the joints and a thin layer of gravel spread over the surface to be worked into the joints by passing wheels. This tar that is poured into the joints becomes brittle as soon as it sets, and the first weight that strikes the blocks cracks it. Water works its way down into the sand, the concrete holds it there until a heavy wheel presses down the thinner blocks, and the water and sand are forced up through the joints to the surface. After the first block is loosened it becomes just so much easier for passing wheels to start the rest. The pumping process is continued, and in a short time a whole section of pavement is loose and sucks down into the soft sand, forming a pronounced hollow in the street.

The result is obtained quickly on the Broadway work, because of the large joints and the rough character of the surface made by using all sizes and shapes of blocks. The joints are already in bad condition over large areas of surface, and as soon as frost comes the damage that will result will be enormous. It has already been large, and will keep on growing even without the aid of frost, for the reasons already set forth.

All the pipes of various kinds under Broadway are below the concrete. The gases that escape or generate are unable to work to the surface because of the layer of concrete. They therefore follow the pipes to a manhole and an explosion occurs, which is another bad defect in the system adopted for the new pavement.

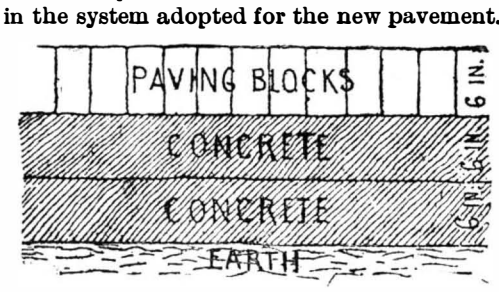


Fig. 3.

In connection with this, it is instructive to note the manner in which pavements are laid in English and Continental cities, as shown in Fig. 3. The blocks, in the first place, have to be of even size, and cut roughly into shape. They are then set with close joints on a solid bed, with perhaps a thin layer of sand as a cushion, and a pavement is made that does not show the effects of wear in years

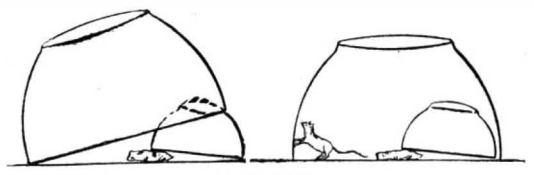
In making such a pavement six inches of concrete are first put in and allowed to set. Then another layer six inches thick is put down, and on top of that the paving blocks are set in wet cement, making a thoroughly durable and lasting roadbed which cannot be stirred nor loosened by the wheels of passing vehicles, no matter how heavy. The gas, water, sewer, and other pipes are all carried in a large tunnel where they can be reached without tearing up the pavement or disturbing the street. Opportunity is also furnished for gases to escape naturally, and explosions under manholes are unknown."

Strychnine for Snake Bite.

A curious instance of one poison killing another is reported from Yackandandah, Victoria, where Dr. Mueller has recently administered strychnine in cases of snake bite. A solution of nitrate of strychnine in 240 parts of water, mixed with a little glycerine, is prepared, and twenty minims injected hypodermically at intervals of ten to twenty minutes, according to the virulence of the attack. In some cases a grain of strychnine has been given thus within a few hours. The two poisons are antagonistic, and the characteristic effects of the strychnine only show themselves after the venom has been neutralized. The first independent action of the drug is evinced by slight muscular spasms and the injections must then be discontinued, unless after a time the snake poison reasserts itself. So long as the latter is active the strychnine can be applied in quantities which would be fatal in the absence of the virus. Out of the hundred patients treated this way, some of whom were at the point of death, there was only one failure, and that arose from the stoppage of the injections after one and a quarter grains of strychnine were administered. Any part of the body will serve for the injection, but Dr. Mueller chooses a part near the snake bite.

A MOUSETRAP.

A correspondent says it costs nothing, does not get out of order, is effective and ever ready.



A Substitute for German Silver.

With a view to obtain, if possible, a cheaper and better article than German silver, that would be suitable for electrical purposes, Mr. A. H. Cowles has been for some time endeavoring to procure alloys of copper and manganese. He found that while pure metallic manganese could with difficulty be reduced by the ordinary methods, it could be cheaply reduced in the electric furnace. This fact has facilitated the production, after a long series of experiments, of a substitute for German silver, which is styled "silver bronze."

The difficulties attending the casting, etc., of a pure manganese bronze have been surmounted by introducing into the alloy a small percentage of aluminum. The addition of 1¼ per cent of this metal to the alloy converts it from being most refractory in the casting process to being most satisfactory in this respect. The addition of aluminum also produces an alloy of much greater non-corrodibility than either German or nickel silver. Silicon and zinc are also introduced with good results.

The "silver bronze" alloy, which has been specially prepared for rod, sheet, and wire purposes, is of the following composition:

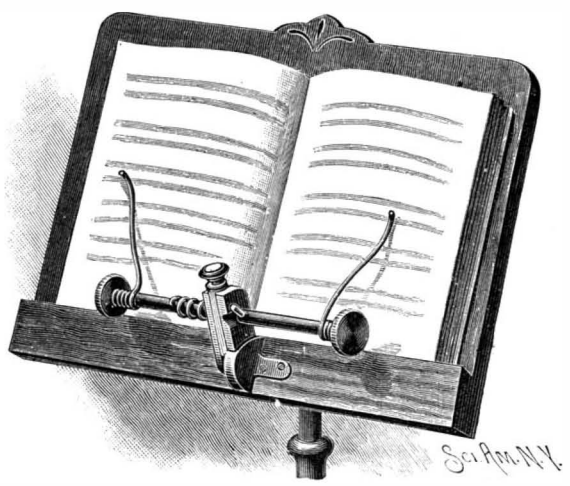
Manganese	18·00	per cent.
Aluminum	1·20	" "
Silicon	5·00	" "
Zinc	13·00	" "
Copper	67·50	" "
	104·70	

This alloy has a tensile strength of about 57,000 lb. on small bars, and 20 per cent elongation. It has been rolled into thin plate, and drawn into wire of 0·008 m. in diameter.

The electrical resistance of "silver bronze" is stated to be higher than that of German silver, and the hope is entertained that we have in it a material the resistance of which will be such that it will afford the electrician better and cheaper wire for the rheostat than any other alloy.

A SIMPLE AND CONVENIENT MUSIC HOLDER.

The device shown in the illustration may be attached to any kind of a music rest, and will hold the leaves so that they cannot be accidentally displaced. It has been patented by Mr. Clarence E. French, of No. 6 Commerce Street, Jacksonville, Texas. The base of the device has a flange by which it may be attached to the lower front edge of a book rest, and in a recess in one side is a series of teeth adapted to hold the main portion of the rest in the desired position. A standard is pivoted to the base, and has a shoulder fitting its upper semicircular surface, while a shaft with milled ends extends transversely through the standard, spring fingers extending upward from the shaft to press upon the leaves of a book. The spring fingers are curved outwardly at their upper ends, so that they will not tear the leaves, and they are coiled around the shaft at their lower ends, the coils increasing their spring action. The fingers are pressed against the book

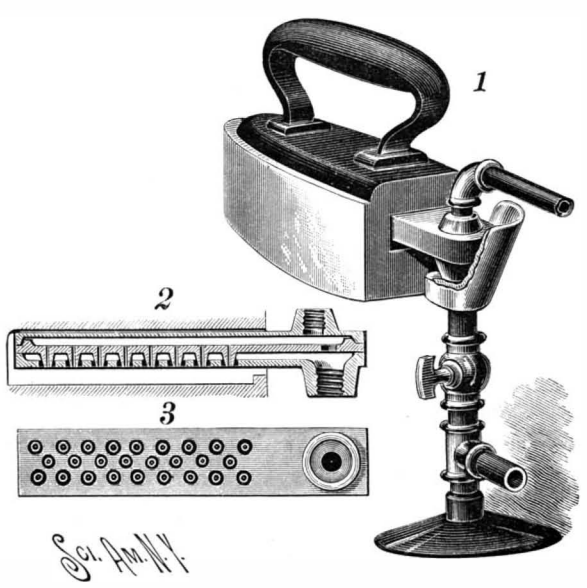


FRENCH'S MUSIC HOLDER.

by a spiral spring around the shaft near the standard, to which one end of the spring is secured, the other end being secured to the shaft, the spring also pushing the shaft endwise to bring a stud in the shaft against the standard. Dovetailed in the front of the standard is a slide having at its lower end a pawl adapted to engage one of the teeth in the base, and at its upper end is a button normally pressed upward by a spring to hold the pawl in engagement with the teeth. When the device is not in use it is turned outward, and the stud in the shaft engages a notch in the standard to hold the fingers away from the rest. When the music is placed in position, the shaft is moved slightly endwise to release the stud from the notch, when the spring around the shaft turns it to cause the fingers to press upon the leaves. By adjusting the slide and pawl the standard may be held at any desired angle to bring the requisite pressure on the book, the fingers being short and light, so as not to obstruct the view of the music.

AN IMPROVED FLAT IRON AND HEATER.

The illustration represents a flat iron and a burner for heating it, the iron being so constructed as to retain a maximum amount of heat and always be kept in a clean condition. The improvement has been patented by Mr. Wendell Hess, Jr., of Tibbits Avenue, Troy, N. Y. The tubular standard is connected with a pipe for the introduction of air to the burner, and at the top of the standard is a cap plate and shield, the inner end of the burner resting on the cap plate. Fig. 2 represents a section through the heater, Fig. 3 being a bottom plan view. One end of the bottom section has a collar surrounding an opening in the plate, the burner being attached to the standard by a thimble screwed into the collar. A collar surrounds an open-



HESS' FLAT IRON AND FLAT IRON HEATER.

ing in one end of the top plate, with which the gas supply tube is connected. In the chamber formed in the burner the gas and air commingle to promote a combustion which will afford a high degree of heat. The iron has an interior chamber into which the heater is introduced, the chamber being open at one end only, and the iron resting upon the upper face of the heater while it is being heated. But a small portion of the heat can escape while the iron is in position on the heater, and the proper degree of heat is quickly obtained.

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A PROPOSED "WHALEBACK" PASSENGER STEAMER.

BY HAROLD AVERY.

Through the growth of transatlantic travel the modern steamship has developed into a floating hotel, and the great ocean fliers of to-day are well nigh as perfect as vessels of their model can be made. Approaching the ideal of a safe, speedy and commodious carrier still nearer is the design presented on the front page, of a steamer intended to lessen the time between New York and Queenstown to five days. The hull is of the steel barge pattern, almost submerged, supporting a strongly built pier beyond the reach of the wildest sea. Two longitudinal bulkheads divide the hull into three main compartments, which are subdivided by transverse bulkheads into twenty-one separate water-tight sections, without doors below the water line. The curved deck affords immunity from crushing waves above and the double bottom from perils that may lurk below. The dimensions are as follows:

Length	528 ft.
" load line	504 "
Beam	72 "
Depth	38 "
Draught	28 "
Displacement	14,000 tons.
	490,000 cu. ft.
Weight of hull	4,360 tons.
" " superstructure	624 "
Capacity of hull	20,000 "
" " double bottom	2,300 "
Distance between double bottom	3 ft.
Necessary to depress hull one inch	73·3 tons.
Area of midship section	1,713 ft.
" " plane of flotation	31,108 "
Center of gravity of displacement below water line	8·5 "
" " " " hull " " "	12·7 "
Common center gravity of hull and superstructure below water line	9·3 "
Height of metacenter, angle 6°	17·4 "
Pressure of wind necessary to deflect to angle 6°, 56 lb. per square foot- tornado.	

It will be seen at a glance that these elements give a stability not possessed by any other form of hull, and even when heeled by a tornado to the extent above mentioned, this model would have a statical stability of 23,476 ft. tons. The engines designed to drive this vessel at a speed of 24 knots an hour are of 19,500 I. H. P., three in number, of the triple expansion type, running 120 revolutions per minute, with propellers of 24·2 ft. pitch, 11·8 ft. diameter, and are to be supplied with steam by sectional boilers at a pressure of 115 pounds.

There will be numerous auxiliary engines for electric lighting, elevators, hoisting, ventilating, heating, etc. The superstructure is supported by five piers twelve feet in diameter, at distances respectively of 60, 180, 204, 228, and 372 feet from the bow, and at distances of 132, 300, and 344 ft. are steel masts, used also as ventilators. Ranged along the deck two feet inboard, and the same distance above the water line, are sockets, 21 in number, which rest upon and are bolted to the deck beam beneath, and whose base forms the deck plate. Set in and bolted to these sockets are cylindrical steel columns 10 inches in diameter, 1 inch thick, 32 feet long and weighing 2,920 pounds. They are flanged at bottom to fit sockets, and at top to contain ends of beams that form a continuous frame for base of the upper works. This frame is connected by transverse beams to the central lattice girder that is supported by and bolted to the piers and masts. To cylinders whose axes coincide with those of the supports below and are 6 inches diameter, ½ inch thick, 18·6 feet in height, flanged at base, middle, and top, two series of beams parallel with the first are joined, the whole forming a light yet wonderfully strong framework that will stand any conceivable natural stress. The beams on the lower tier are 24 feet long, 5 inches flange and half inch web; those above proportionately lighter. The space between the hull and floor beams is 24 feet.

The arrangement of apartments may be seen from the plans. The lower floor is devoted entirely to staterooms that are lighted by incandescent electric lights at night. During the day those rooms along the central girder are lighted from beneath by disk grating, over which an electric mat heater is placed. Accommodation for seven hundred and twenty first-class passengers is provided for. Steerage travelers will of course be limited to the hull. On the upper floor are the various halls, parlors, a grand dining room, and as novelties a billiard parlor, baths, a laundry and ocean mail room; and for those who delight in promenades, two four feet wide completely round the floors, and that upon the roof. Passage between the hull and superstructure is accomplished by means of electric lifts, within the first, central, and last piers. By the separation of hull and living apartments the passenger is enabled to avoid the smell of machinery, the racket of freight handling, and all those ills that transatlantic travelers condemn. By the union of ship and hotel he is enabled to convert the voyage of three weary months in an open caravel into five days of luxurious ease and pleasure. The accommodations and capacity of a ship thus designed will commend it to the favorable notice of those interested in European trade and travel.

Correspondence.

Decay of Bone in the Mouth.

To the Editor of the Scientific American:

While rolling the broken-off head of a bone collar button in my mouth it fell into a hollow tooth. As it closed the tooth effectually, it was left there for about two months, when it was found to be tough and glue-like in appearance, like bone treated with sulphuric acid, thus showing the effect a decayed tooth has on the others. F. E. B.

South Bethlehem, Pa.

High Temperature in Fevers.

To the Editor of the Scientific American:

The following remarkable instance of the intense degree to which fever heat may range in the human body, even during life, is reported for the information and investigation of scientists.

Quain, in his "Dictionary of Medicine," says, "a temperature of 106° indicates great danger;" but Dr. Wilson Foy relates a case in his experience in which the temperature reached 110°. These with some others are accounted extraordinary records of high temperature. Wunderlich noted a temperature of 112·55° in a case of tetanus; but this temperature was reached after the patient expired. It is evident, therefore, that up to a temperature of 110°, or even 111°, in some exceptional cases, a patient may live, but we have no instance anywhere recorded of a patient surviving a higher temperature than that. The following, therefore, which is a thoroughly trustworthy and authentic account, and may at any time be verified by such as are desirous in the cause of science to inquire further into it, is worthy of record, and I therefore send you such details as I am in possession of, and which I have obtained from an eye witness, for a corner in your scientific paper, in view to inviting further investigation into such cases.

In July last, at Naini Tal, a hill sanitarium in British India, situated in latitude 29° 22', longitude 79° 29', at an altitude of 6,409 feet above sea level, a religious lady in St. Mary's Convent was attacked with what appeared to be an ordinary fever. After a few days symptoms of typhoid fever developed, and the patient's temperature was taken by the doctor in attendance, a clinical thermometer with a range of 110° being employed. On the application of the thermometer the temperature of the patient was found rising rapidly till the quicksilver reached its maximum limit of 110°, when the registering tube burst. Another clinical thermometer of the same range was immediately procured and applied with the same result, and another and another. After four of 110° range had burst, one of 115°, and 2° over, was procured and used, and this also burst. At this last experiment, the military surgeon in charge of the convalescent depot was also present. It is therefore, in point of fact, unknown how much above 117° her temperature may have risen, as no thermometer of a greater range was procurable. But the most remarkable feature in the case remains to be told, and that is, the patient has made a good recovery, and is at this present time doing well in her convent at Naini Tal.

The lady is a German by birth, is aged 38 years, has been 12 years in India, and has a strong, robust constitution; but to my thinking no constitution, however strong, could go through such an ordeal without supernatural aid.

I am not too ready to believe in miracles, I am a skeptic, but if this is not a miracle, I should like to know if science has discovered any other name for it.

I have had a long experience of fevers of all kinds in this land of fevers; but I have never heard or seen a case in any way resembling this. The patient, notwithstanding the extraordinary intensity of the fever which raged in her, was never so totally unconscious as not to be able to recognize those who were in constant attendance on her. She was at times delirious, but only for short intervals, and considering she has been ill altogether only seventy days or thereabout, her recovery seems to be as wonderful as the malady from which she has suffered. The medical authorities have pronounced her case one of typhoid fever; but perhaps science will be able to find an exceptional name for a fever that no heat-registering invention has been able to gauge. D.

Lucknow, East India, September 21, 1891.

The Fiber Exhibit at the Exposition.

The efforts which are being made to increase the production of vegetable fiber in this country will receive a strong stimulus from the display of fibrous plants and their products at the Columbian Exposition.

Group 9 of the official classification includes all of the vegetable fibers, such as cotton, hemp, flax, jute, ramie, in primitive forms, and in all stages of preparation for spinning, substitutes for hemp, cocoanut fiber, and all similar substances.

This country grows annually about one million acres of flax, and a very large acreage of hemp, and these two are our principal fiber-producing plants, with the exception of cotton.

Our imports of textile grasses and fibers now amount to about 258,000 tons per annum, valued at about fourteen million dollars. There seems to be no good reason why a large part of the above sum should not be paid to the home producers, which would be the case if more attention was paid to the production of the vegetable fiber in this country than has been done in the past. Heretofore the flax has been grown by the farmers of this country almost entirely for seed, a part of the straw going to tow or paper mills and bringing on an average not more than $2.50 to $4 a ton, the remainder, and much larger part, being burned or wasted. To what extent flax may be profitably grown both for seed and fiber is one of the vexed problems which it is hoped the exhibit at the exposition will throw some light upon. Investigations show that the average humidity of the flax-producing sections of this country is the same as that of Belgium and other parts of Europe where the production of flax for fiber is the chief industry of the farming population, and the exhibit of flax from those countries will no doubt prove very interesting and valuable to the American farmers.

Fibrelia, a new product from common flax straw, promises to have an important bearing on textile interests in the future. By a process of manipulation the straw is reduced to a short staple very closely resembling cotton or wool, and when mixed with either is said to add materially to the value of the product in beauty and strength. It is claimed that twenty-five per cent of fibrelia mixed with seventy-five per cent of wool made into broadcloth gives a product much more valuable than if made of wool alone.

The area devoted to the cultivation of American hemp has of late years been extended into States north of the Ohio River, and recent experiments encourage the hope that Sisal hemp may be profitably grown in Florida.

Among other fiber plants now attracting considerable attention, especially in the temperate sections of the United States, where there is not a great amount of rainfall, is ramie, a plant indigenous to Java and China, and from which it is exported in large quantities to France, Germany and England, and manufactured into linen and silks. California has appropriated $5,000 to purchase ramie roots for free distribution and as a bounty for merchantable ramie. The fiber of this plant receives and retains the most brilliant dyes, is very repugnant to moths, and its tensile strength is forty per cent greater than flax. It ranks next to silk as a textile fabric. When cultivated it grows luxuriantly in the Southern States and in Southern California, and the only difficulty attending the product is that a machine which will effectually separate the fiber from the stalk has not been produced, although a number of machines have been invented for the purpose and will be exhibited at the exposition.

The exhibits of hemp, flax, jute, ramie, etc., at the Paris Exposition in 1878 and at the Centennial in 1876 were very interesting and complete, and it is the purpose of Chief Buchanan, of the Agricultural Department, to make this group at the Columbian Exposition equally so, and fully illustrative of the progress made in later years in the cultivation of fiber plants and the methods of preparing the raw material for market.

Metallochromy.

Metallochromy is a process of direct polychrome printing upon metallic surfaces recently presented by Mr. Josz, its inventor, to the Society of Encouragement of National Industry. Hitherto, all impressions upon metal have been obtained by the transfer of a freshly printed sheet, or by the transfer of the impression upon a sheet of rubber to a sheet of metal. To this effect, it is necessary to construct special lithographic presses in order to obtain an exact adjustment of the colors forming the subject. In order that the printing may be done directly from a hard surface, that is, the lithographic stone, upon another hard surface, that is, the metal, it is necessary to be able to render the metallic surface elastic enough to take the ink that the stone carries, without impasting or destroying the details of the subject. In order to reach such a result, the process employed is as follows:

Upon the metallic surface to be printed there is produced by the mechanical action of very fine sand a fine and close grain, which is diluted and cleaned by immersion in different alkaline solutions. This roughened and velvety surface takes a lithographic impression as well as paper and fabrics do. Immediately after the printing, the sheet of metal is submitted to a temperature of 50 degrees in a special stove, the object of which is to cause the ink to enter the pores. The impression is therefore no longer superficial, but is printed in the metal itself, whose expansion and contraction it may follow without undergoing any alteration. The metallochromic prints, covered with two coats of varnish, applied hot and fixed in a stove, present the same characters of durability as faience and enamel.—*La Nature.*

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Molecular Changes in Nervous Structure.

For the future of physic we require to revise our views respecting the molecular changes which occur in nervous matter. The discoveries, in electricity, of Galvani and Volta, and the experiments made by Aldini, the distinguished nephew of Galvani, at the commencement of this century, were sufficient to startle every mind, and to develop a new era of thought. In 1803, one John Forster, a malefactor, twenty-six years old, was hanged at Newgate on the 17th of January, a cold, frosty day. The malefactor swung in the cold air one hour, with the thermometer 2° below freezing point. Then his body was conveyed to a house near, and in pursuance of sentence was delivered to the College of Surgeons. Master Keate, Master of the College (some of us remember Master Keate very well), Carpue (Thomas Hood's own Carpue), Hutchins (one of Carpue's prosectors), Cuthbertson the electrician, Blicke, an anatomist, Dr. Pearson, a physiologist, and young Mr. Brodie, were all at this house, together with Aldini. Aldini had a battery of forty cells in three troughs, and malefactor John Forster, cold, stiff, and stark, was subjected to the influence of the battery. An arc was made from the ear to the lower part of the trunk, and as the electrical stream flowed and penetrated into the life-suspended muscles, those muscles played again. John Forster grinned horribly at his manipulators as if they were hurting him; he opened one eye, and fixed it on something; he moved his limbs. They withdrew the electricity, and John Forster was quiet again; they tried if strong ammonia to his nostrils would influence him, and found it would not; but they re-applied the electricity with the ammonia, and the effect was so extraordinary they thought the wretch was actually alive again; but they stopped, and he stopped. Then they opened his chest and exposed his heart, to find that no electrical current would restore its rhythm; so it was clear that all through the experiment John Forster had not lived by his heart. It is also clear that voluntary muscles may be irritable, while the involuntary heart is quite dead.

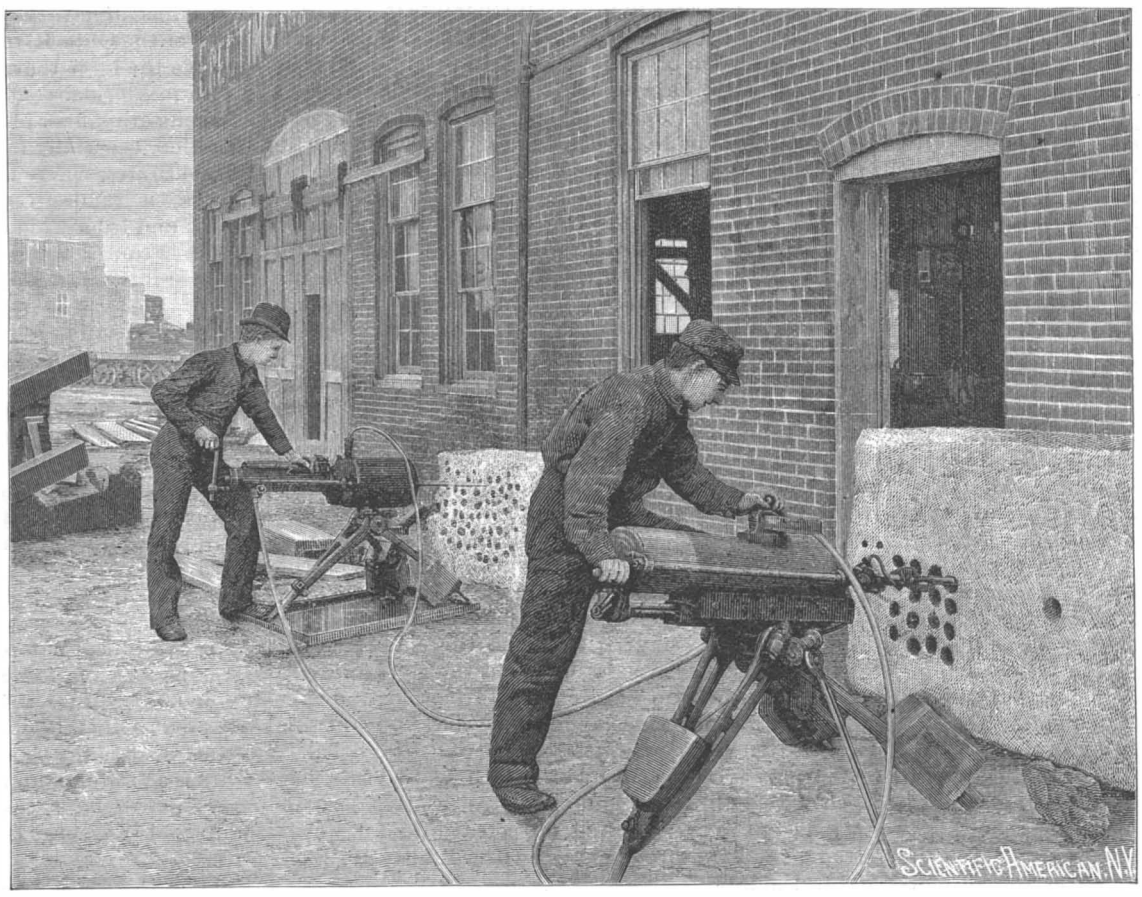
The experiment, as well it might be, was the marvel of the world, and Aldini, who did not, he tells us, mean to bring the malefactor back to life, became the hero of the hour. He was "presented." Master Keate made a good stride toward court eminence, and altogether there was popular fame on the winds traveling briskly over John Forster, malefactor, in 1803. As to the world of science, it was wild with commotion; a volcano bursting through a tranquil lake were not more grandly disturbing. Other experimentalists performed the same experiments on dead malefactors, and with like results; Galvani's theory of animal electricity recovered from the attacks of Volta; and by a vast leap of learned speculation, the human body was declared to be an electrical machine. Of course, for is not the torpedo such a machine, and is not that proof direct? So at once the old researches, from the time of Sylvius, through Haller, Winslow, the Munroes, about the existence of a veritable nervous fluid, went to the wall without question, or were as ignored as if they had never been.

Galvani's and Aldini's experiments were astounding, and rightly read they retain, as do all carefully proved facts, a lasting value; but they led to more error than any of which I know. There is nothing in science of nonsense so gross as the garner of nonsense that has been gathered up to this very time on the so-called animal electricity. Incoherency can go no further that it has gone in this direction, while science has not advanced a minute's march in ninety years toward even a preliminary demonstration of the existence within living bodies of a sign of an electrical mechanism, except in the rare cases of one or two specially constructed electrical animals.

Here then, I think, we have to call back and revise. We want to know, even yet, whether there be a nervous fluid traversing the nervous cords, or circulating between the nerve centers and the blood. And, particularly, we want to ascertain what is the molecular change of matter of the nervous system, when it sleeps or rests, when it wakes or moves. Light, I am glad to say, begins to break on this primary inquiry. We can make nervous substance temporarily solid by cold, *i. e.*, by crystallizing it, and then the nervous structure rests and sleeps. We have to see, then, whether, when our eyes droop with natural sleep, this same change of structure is not progressing naturally in nervous structure; we have to ask whether under sudden shock—shock from a bullet, for instance—the complete destruction of nervous power is not due to change of nervous matter under sudden vibration of its particles, like the change which occurs when water suddenly solidifies under motion, or when fluid fat becomes a concrete mass under brisk agitation.—*Dr. B. W. Richardson, in the Asclepiad.*

ELECTRICAL ROCK DRILLS.

One of the most prominent exhibits at the Electrical Exhibition held in connection with the Montreal convention, and which attracted as much attention as any part of the whole exhibit, was that of the Edison percussion and rotary mining drills. The accompanying illustration shows these two machines at work. The Edison percussion drill will bore at the rate of three inches per minute in the hardest granite. It requires but little power to operate it, and, of course, can be worked at any reasonable distance from the dynamo, the limit suggested by the company being three miles. The drill is simple in construction, and there is nothing about it that would be affected by moisture. The diamond prospecting core drill, designed for locating mineral deposits, was also shown. This machine will bore 150 feet into the earth, bringing out specimens of mineral for the examination of the prospecting parties. Aside from this, the exhibit at Montreal included coal drills, electric hoists, fans, and pumps for mining use, an indication that the Edison company is turning its attention in a very practical way to this very important application of electricity.—*Electrical World.*



THE EDISON ELECTRIC ROCK DRILL.

How to Manage a Semi-Dry Brick Press.

Were I to take charge of a semi-dry brick press, before I would start it, I would first examine it all over carefully and see that there are not any loose bolts, broken cogs, or other breaks or obstruction of any kind, such as blocks, cold chisels, ranches, etc., left anywhere in the machine. I would examine the dies or moulds and see that the liners and moulds were well bolted, see that the feed spout and the feed box are clean, and no nails, wood, or any rubbish so natural to brick yards, and brick yard carpentry and neglect, that would wedge under the feed box and break the guides or cams controlling those particular complicated parts when in operation. After I am satisfied that everything is clear and in safe working order, I would see that all the oil wells and oil cups are clean and filled with oil. At all places where I would find open oil holes and no cups for them, I would cover them with wooden plugs to keep dirt and clay out, to keep them from clogging up. From time to time I would examine all the journals, boxes and guides, and see that they were well oiled and not cutting. I would put a heavy coat of oil inside of the moulds. With everything ready for the start I would put on the belt, and holding the clutch lever in the left hand, I would slowly and carefully let the machine turn over (having no clay in the feeder of course). I would particularly notice that the plungers would lead into the moulds without cutting against the side. If the plunger faces would touch the sides, I would loosen the bolts holding the plungers to the cross head and adjust them properly, and equalize the space all around them and again tighten up for keep. After the second and a few more slow revolutions proved satisfactory, I would throw on the clutch and let her run for a minute or so at full speed, go all around it and see that everything is in working order. While the machine be running empty, I would raise the clay adjustment so that the moulds would not be over 4½ inches deep. Then I would stop the machine and fill the clay spout, letting it fall gently into it, as not to unequally pack it. When that had been done I would again let the press start up slowly under a light pressure, having one hand on the clutch lever for instant, if necessary, and then gradually lower the clay adjustment until the proper pressure or amount of clay in the moulds had been reached, which generally can be seen when the bricks begin to burst or split open lengthwise through the flat center. This last mentioned feature is the *tickler* of the scientific brick machine inventors, and there are not a few theories about this little simple thing that makes one astonished over the ignorant ideas that some of these learned men of the ironclad conscience have. One of the most surprising things is that they all claim that all their machines have sufficient pressure to exclude the air, and that it is the elasticity of the enormously compressed clay that rebounds and thus breaks the bricks. It is very true that there is a difference in presses and some produce better results than others, but in all cases it is the unexcluded and compressed air in the brick that breaks them; and when by that stage the pressman wants to guide his work, when the stage of indication of the splitting of the brick has been reached, then the amount of clay in the mould wants to be a trifle lessened as just to keep below that point, and the success will be the greatest. Occasionally the clay wants to be increased to see how near the quantity is right. It is better to throw away a few brick once in a while than to run too far different from the proper hardness.

Every machine should have a steam die-heating attachment using hot dies, say about 200 degrees temperature. In cold weather the clay will stick to the cold metal of the plunger plates or faces and cause much delay in cleaning them if dies are not heated. When hot dies are used, care must be taken that the plunger plates are not too close fitted; heating the dies and moulds, the steel of them will expand about one-sixteenth part of an inch and thereby getting too close fit, bringing the metal surfaces into contact and cut and damage them. At noon and evening, when shutting down work, the mould should always be oiled; in the winter time a little steam should be kept going through the plunger heads at night to keep them from freezing; it will save much delay and loss.

The driving belt on a press should not be kept too tight, as it is about the only safety guard on the present machines that are on the market. In case of an overload or some other accident it would give the machine a chance by letting the belt slip or run off. With a little common sense and care the poorest press can be kept in fair order.—*Clay Journal.*

A New Thermometric Scale.

F. Salomon proposes a scale which has a relation to absolute zero, so that its readings directly indicate the volumes of gases at various temperatures. The starting point is —273° C.; from this to the freezing point of water the scale is divided into 100 equal parts, so that 0° C. corresponds to 100 of the new scale. From this to 273° C. the scale is again divided into 100 equal parts, 273° C. being 200, the same proportion of division being continued as far as desired. Each degree of the scale is therefore equal to 2·73° C., and 1° C. to 0·3665 of the new scale; the boiling point of water lies at 136·6.

The use of the new scale is seen from the following examples: One cubic meter of a gas at 0° C. or 100° absolute temperature would measure at the boiling point of water (136·6) 1366 liters. At 200° C. or 173·2 absolute temperature, it would have a volume of 1732 liters.

G. Lunge recommends this scale as forming the solution of a little difficulty which is felt in gas analysis.—*Zeitsch. f. angew. Chem.*

HOT water cannot be raised to any considerable height by suction.

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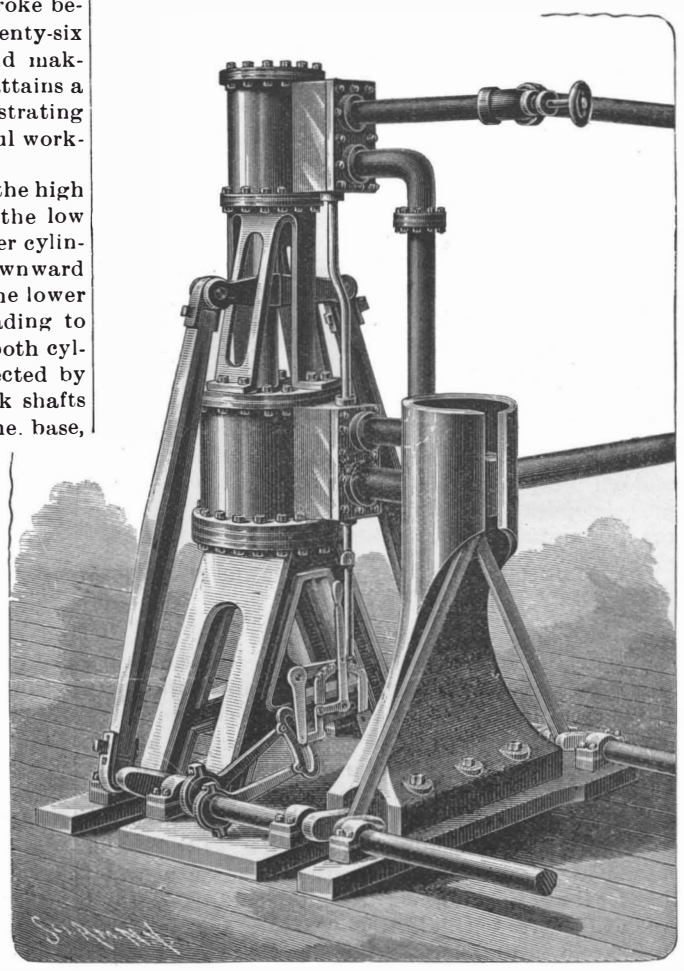
A TWIN SCREW LAUNCH RUN BY A COMPOUND ENGINE.

The launch shown in our illustration was built in New Westminster, British Columbia, Canada. She is 42 ft. keel and 7 ft. beam, and has 4 ft. depth of hold. She has an improved Clarke compound engine, also shown in an accompanying illustration, with a high pressure piston four inches in diameter, and a low pressure piston eight inches in diameter, the stroke being six inches, and the engine driving two twenty-six inch screws. With 130 pounds of steam, and making 275 revolutions per minute, the launch attains a speed of nine miles per hour, thus fully demonstrating the adaptability of this engine to the successful working of twin screws.

In the Clarke engine, the exhaust pipe from the high pressure cylinder leads to the steam chest of the low pressure clylinder, while the piston in the upper cylinder is secured on a piston rod extending downward and connected with a piston operating in the lower cylinder, the exhaust pipe from the latter leading to the outside. On the piston rod common to both cylinders is secured a crosshead pivotally connected by two pitmen with opposite crank arms on crank shafts mounted to turn in suitable bearings on the base, which also supports a frame carrying the low pressure cylinder, on top of which is a frame supporting the high pressure cylinder. The valves in the two steam chests are connected with each other by a valve rod connected at its lower end in the usual manner with the reversing link, operated from eccentrics secured on one of the crank shafts.

The crank arms stand at angles to each other, so that the crank shafts are turned in opposite directions, and the position of the link is such that it can be readily changed by the reversing lever to simultaneously reverse the motion of the crank shafts. On the crank shafts are also formed two other crank arms pivotally connected by opposite pitmen with a slide mounted in vertical guideways, supported on a frame erected on the base, the motion of the crank shafts causing the vertical sliding motion of the slide traveling loosely in the guideways, and thus serving as a governor, as, in case one of the propellers becomes disabled, the power of the shaft carrying the disabled propeller is directly transferred to the other shaft through the crank arms, pitmen, and slide, and the other propeller is caused to do all the work. All the parts of the engine are within easy reach of the engineer, and there are so few working parts in motion that the friction is reduced to a minimum.

It is said that the plan of construction and the operation of this engine have been carefully observed by practical engineers, and that, considering the dimensions of the boat, her speed, the smallness of the power, the ease with which she passes the centers, the absence of vibration while running, and the very few working parts in motion, the engine is a notable success. She can be run at a very high velocity without injury or risk, and is designed to be very economical in cost and in weight and space. This engine has been recently patented in the United States and foreign countries by Mr. James A. Clarke, of New Westminster.

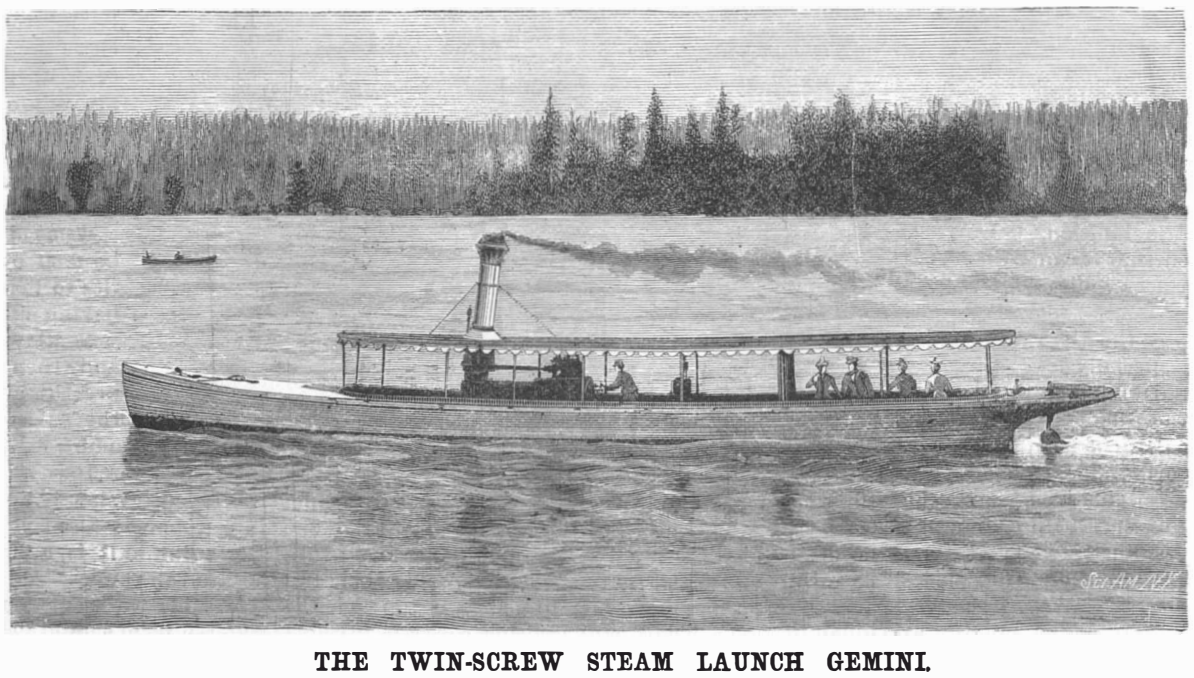


THE CLARKE COMPOUND TWIN-SCREW OPERATING ENGINE.

Electric Cars in Boston.

At the recent meeting of the American Street Railway Association Mr. Pearson of Boston said his road has about 350 cars equipped with electric motors. The expense of operation with horses is about 25 cents per car mile, including everything connected with the operation, fixed charges and the track repairs. In Boston the cost of operation is quite high as compared with some other cities. You will find in many cities the cost of operation of horse cars is below 25 cents, but we pay a good price for labor, on account of the running of our lines in the congested parts of the city, where we cannot get as much work out of a man as you can in other cities. This makes a greater cost of operation. The cost of operation with electric motors up to the present has been about 20 cents per car mile. The increased cost of operation in our city is also true to a great extent with electricity. We pay 25 cents a day more for motor men and electric car conductors than we do for horse conductors and drivers. That has been our experience up to this time. We save about 25 per cent. Our men are expected to work 10 hours a day, but we really get anywhere from 7½ to 9½ hours a day. The amount of power consumed is considerably more, on account of the slow speed with which the motor cars have to operate in the downtown sections of the city. There the streets are crowded with teams and cars, and I suppose that the cars run at an average of perhaps one or two miles an hour for a distance of from one-half to one mile, which of course decreases the profits very materially. We expect to get the cost of operation down to 16 or 17 cents per car mile. Another item of expense to us is the high cost of power, we having been obliged to hire power from an electric light company and pay them a good price for it, of course much more than it would cost a street railway company if they had their own power house. As I said before, the saving of electric cars, as compared with the horse system, is about 25 per cent, being about 20 cents per car mile for the electric cars and 25 cents per car mile for horse cars.

We began with a sixteen-foot motor car very similar to the old horse cars. We have changed from that to a long car, which is 26 or 28 ft. long in the body and 35 ft. over all; that is the car we have adopted as our standard. For our purpose we find a decided improvement in earnings and saving in operating expenses per passenger with the long car. I imagine that the conditions in Boston determine that for us, and in other cities it may be that the short car would be more profitable for operation. We find the long car earns a great deal more per car mile, and we need only the same number of men to operate it as with the short one. From our tests we find that the amount of power consumed on a level track is very little more for the long car than with the short one; in fact, the weight which we have in the car seems to have little to do with the current consumed, as long as the car is on a level track. From tests, we found that with a long car empty, weighing, perhaps, 18,000 pounds, using a certain average amount of current, the same car loaded with 15,000 pounds of weight used very little additional power until we come to a grade. We have experimented in this matter, and could hardly tell from the reading which was the empty and which was the loaded car. That being the case, it does not cost much more to operate long cars than short cars. Again, they carry nearly double the people, and do it with the same expense for conductors and drivers. Just how much more heavy cars will increase the track repairs of course we cannot tell at present.



THE TWIN-SCREW STEAM LAUNCH GEMINI.

A Poisonous Thimble.

Among the numberless causes of blood poisoning through the skin, one which was lately recorded is worth noting on account of its evident simplicity and the ease of its prevention. In the case referred to the sufferer was a seamstress, and the mischief resulted from her using a dirty metal thimble marked with verdigris, a little of which appears to have entered a scratch on the thimble finger. We can well believe that this accident was not the first of its kind. Verdigris, it is true, is a mere metallic irritant, and not comparable in virulence to most living germs of disease. It is quite enough, notwithstanding, to excite local inflammation, which friction, contact with dyed cloth material, or the entrance of dirt in any form would quickly convert into a dangerous and general disorder. There is really no excuse for women who trust their fingers in these cheap and worse than useless articles. Steel thimbles are much safer and cost very little. Another variety also in common use is enameled within, and is, if possible, even freer from objection. Let us not forget to add a caution that cuts or scratches on the hand should never be neglected by sewing women so long as dyes continue to be used in cloth manufacture.—*Lancet.*

Spectroscopic Analysis.

Prof. Ostwald (*Chemiker Zeitung*), in a discourse on the progress of physical chemistry, delivered before the Congress of German Naturalists and Physicians, declared that, owing to the recent investigations of Baluezs, Deslandres, Kayser, Runge, and others, results have been reached which justify the most sanguine hopes. It is generally believed that all substances are dissociated in the electric arc into their elements, and that thus a spectrum of their components is obtained. All substances which are formed with absorption of heat become more permanent as the temperature rises, and inversely. In many instances this inverse case occurs, but it cannot be assumed as the universal and sole cause of the phenomena.

Horse Chestnuts and Acorns as Human Food.

At the recent Congress of German Naturalists and Physicians, P. Soltsien (*Chemiker Zeitung*) recommended the use of ammonia at 10 per cent. as a suitable agent for removing tannin and poisonous alkaloids. Horse chestnuts and acorns must be previously comminuted. As lupins contain no starch, it should be added to the purified product in the shape of ground acorns. The attempts at utilizing horse chestnuts (essentially removal of sapotoxine) are not very satisfactory, as the loss of substance is very considerable. Fragments of the rind must also be removed, as they contain much tannin. Attempts to make horse chestnuts edible by roasting have not yielded good results; the sapotoxine is certainly destroyed, but the nuts cannot be eaten, as the fatty oil takes an unpleasant taste on roasting. The results which the author obtained in removing the bitterness of acorns are noteworthy. In addition to the ammonia process he obtained good results by extracting the acorns six to eight times with cold soft water, and drying immediately afterward. The loss by this method is still too great (25 per cent), consequently Soltsien prefers to make the acorns up into a paste with milk, and allow them to ferment. Acorn meal so prepared costs at most 4d. per kilo.

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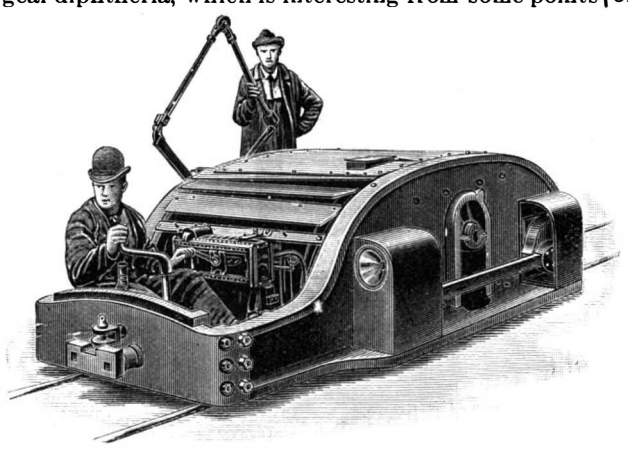
ELECTRIC MINING LOCOMOTIVES.

In October, 1889, the Thomson-Houston Electric Company designed and installed in the Erie colliery of the Hillside Coal Company a successful electric mining locomotive. The requirements of other mines, however, have led to the production of a locomotive differing essentially from that in the Erie colliery, and a type known as the "Terrapin Back" is shown in the accompanying illustration.

It is most substantially and solidly built, the interior mechanism being entirely protected by a heavy iron armor, and possesses in a marked degree the important features of strength and solidity. The motor for operating the locomotive is of the iron-clad consequent pole type, having a Gramme-ring armature. It is provided with the radial type carbon brushes and elongated commutator segments, by means of which the most durable connection with the armature coils is obtained. The motor is situated midway between the axles, the proper speed reduction being attained by means of a train of gears. The locomotives can be run at various speeds, the motors being wound for any speed from four to ten miles an hour.

The locomotive is provided with the necessary controlling devices, all placed within easy reach of the operator. A special type of rheostat, composed entirely of mica and German silver, is employed, and a new and improved brake lever and reversing switch. The trolley arm through which the current is conveyed to the motor is of the double elbow pattern, which accommodates itself automatically to the varying heights of the conductor, and permits the operation of the car in either direction. On each side of the locomotive is placed an incandescent lamp, which serves the double purpose of signal and head light. A 220 volt generator supplies the necessary current.

The Thomson-Van Depoele Electric Mining Company, which designed this locomotive, has also in process of construction several new types suited to the requirements of different mines, hard and soft coal, iron and other metals, and for high and low entries, and for gauges varying from eighteen inches to the standard. The success of the apparatus already installed has given great impetus to this branch of applied electricity, and will undoubtedly result in the still further use of electricity in mining operations.



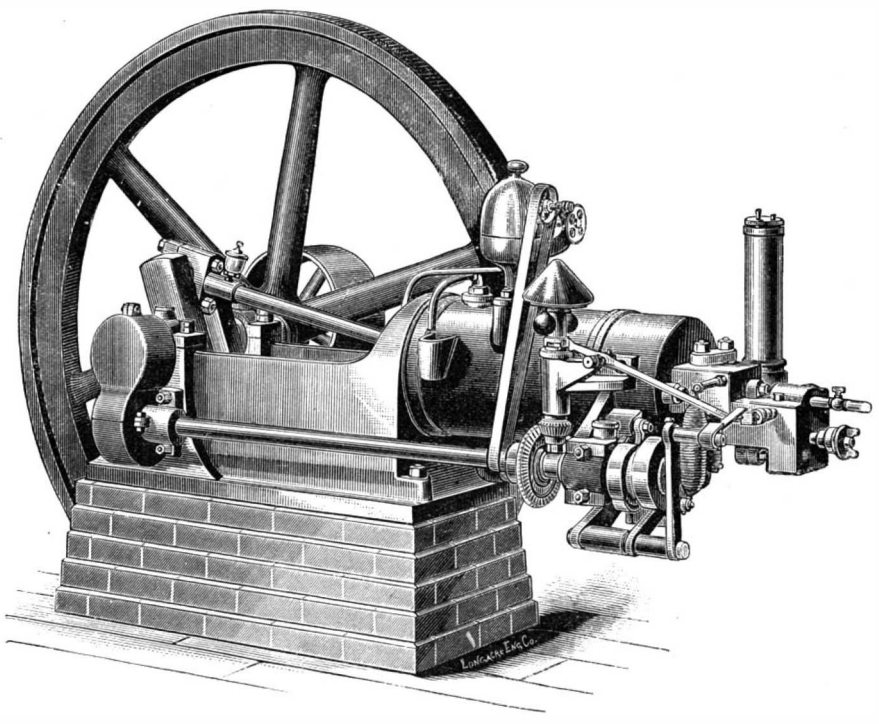
A THOMSON-VAN DEPOELE ELECTRIC MINING LOCOMOTIVE.

THE "OTTO" GASOLINE ENGINE.

The successful gasoline engine should, first of all, be so constructed as to prevent any leak of gasoline either in vapor or fluid form, and it should besides be simple in design and reliable in operation for each function belonging to the cycle of work of the engine. The Otto Gas Engine Works, of Philadelphia, who have made a national reputation on their Otto gas engines, have endeavored to meet these conditions, and the engine herewith illustrated represents the smallest size of such an engine which they have recently placed on the market. No separate apparatus is used for producing vapors, but the gasoline is conveyed to the engine from a supply tank placed outside of building, and only mixes with air when it reaches the engine cylinder, where it is fired at once.

The igniting is done by a hot tube, which has been found so efficient a device with the modern Otto gas engines, and this tube is heated by a flame, similar to that produced in gasoline stoves, and surrounded with the same precautions for safety. The Otto gasoline engine is also fitted for electric ignition, and the engine is so arranged that it can be furnished with either form of igniter as desired.

Among the sizes offered by the Otto Gas Engine Works some are specially designed for electric lighting, running at high speed and adapted for use in country residences, hotels, public gardens and grounds, etc. Other sizes have been made of portable design and are available as farm or contractors' engines, for thrashing, hay baling, pumping for irrigation, etc. The size illustrated is of about four horse power, and this size has been in demand from grain dealers for running elevators, conveyors, feed mills, corn shellers, etc. The running expense is of course very low, and as compared with gas engines the cost corresponds to that of gas at 60 to 80 cents per 1,000 c. ft., gasoline being 8 to 10 cents per gallon.



THE "OTTO" GASOLINE ENGINE.

SUNOL, the new mare of Mr. Robert Bonner, trotted a mile, in harness, in 2 m. 8¼ s. This was on Oct. 20, at Stockton, Cal. This is half a second faster than the time made by Maud S., heretofore the fastest trotter in the world. Both horses are owned by Mr. Bonner, of New York.

New Treatment of Diphtheria.

The highly unsatisfactory state of the therapeutics of this terrible destroyer of infantile life is assuredly in nowise better shown than by the amount of literature constantly devoted to the subject and the number of systems of treatment continually being proposed. Pretty nearly every drug in and out of the Pharmacopœia has had its advocates, and still the sheaves are garnered, and the edge of the sickle has not been turned by drugs and systems.

Professor Seibert proposes (*Archives of Pediatrics*, June, 1891) yet another system of treatment of pharyngeal diphtheria, which is interesting from some points of view. Basing his ideas upon the fact that the pharyngeal manifestations of diphtheria begin as a local process, and that this owes origin to the entry and penetration in the mucous membrane of the Klebs-Loeffler bacillus; that the pseudo-membrane is not the disease, but the result of the disease, and is "a safe guide to the diphtheritic inflammation below it;" that the chief treatment should be local, and that the removal of pseudo-membranes is useless, as the bacilli contained therein are of no further consequence, and that local treatment, as carried out generally, does not reach the *active* bacilli in the lower strata of inflamed tissue, and is therefore neither local nor germicidal; that wiping away the pseudo-membranes and applying strong antiseptics to the parts is also ineffective, as only tending to cauterize and infect the healthy surrounding mucosa, to rubbing the bacilli into deeper parts, and is without germicidal effect, Professor Seibert has devised instruments for the purpose of bringing comparatively small, but very strong, solutions into *direct* contact with the bacte ia which are in activity upon the lower stratum of the mucosa. The anti-bacillary medium to be used is the officinal and freshly prepared chlorine water of the United States Pharmacopœia, and with a special syringe (the chief feature of which appears to be that instead of one needle point there are five such points arranged on a flat disk) the points are pressed firmly in to their full length into the pseudo-membrane, so as to reach the inflamed tissue below, and chlorine water is injected into the part. Thus brought into direct contact with the active bacilli and cocci of diphtheria, these latter are immediately destroyed, and "the process comes to a stand-still." The contact of the chlorine and the active germs is the foundation of the treatment.

After the injection a gargle of one or two grammes of tincture of iodine, and ten drops of concentrated carbolic acid, in four ounces of water, is given, a teaspoonful being alternately gargled and swallowed every fifteen minutes, from 6 A. M. to 12 at night; five drops for gargling, and half a teaspoonful every half-hour for swallowing, being given to younger children. Zinc and mercurial ointment is rubbed into the swollen glands every two or three hours or less, and an icebag adjusted over the swollen parts of the neck. It is claimed that where the process is localized, and the membranes are undermined by the chlorine injections, the temperature makes three to four degrees, and the œdematous swelling disappears. Though the pseudo-membranes remain in the throat for two to four days, they are harmless, but the mouth wash keeps them from spreading the process. Of thirty-five cases, Dr. Seibert claims to have only lost two under this method of treatment, and none of his patients developed diphtheritic paralysis. If we could be sure that the arguments in favor of the treatment were not of the *post hoc, propter hoc* kind, we might be tempted to echo the author's remarks, that "these cases are sufficient to show that the chlorine water injections are efficient, local, and germicidal' enough to check the career of any diphtheria germs they come in contact with." At all events, the results are good, the treatment novel, and, in view of the disappointing nature of most plans of treatment of diphtheria, we cannot afford to disregard any suggestion, based upon respectable data, for contending with this formidable disorder.—*Journal of Laryngology and Rhinology*, Aug., 1891.

Effect of Water upon Horses.

A horse can live twenty-five days without solid food, merely drinking water; seventeen days without either eating or drinking; and only five days when eating solid food without drinking.

An idea prevails among horsemen that a horse should never be watered oftener than three times a day, or in twenty-four hours. This is not only a mistaken idea but a very brutal practice. A horse's stomach is extremely sensitive, and will suffer under the least interference, causing a feverish condition.

Feeding a horse principally on grain and driving it five hours without water is like giving a man salt mackerel for dinner and not allowing him to drink until supper time—very unsatisfactory for the man.

If you know anything about the care of horses, and have any sympathy for them, water them as often as they want to drink—once an hour, if possible. By doing this, you will not only be merciful to your animals, but you will be a benefactor to yourself, as they will do more work; they will be healthier; they will look better; and will be less liable to coughs and colds, and will live longer.

If you are a skeptic and know more about horses than any one else, you are positive that the foregoing is wrong, because you have had horses die with watering them too much, and boldly say tnat the agitators of frequent watering are fools in your estimation, and you would not do such a thing. Just reason for a moment, and figure out whether the animal would have over-drank and over-chilled its stomach if it had not been allowed to become over-thirsty. A horse is a great deal like a man. Let him get overworked, overstarved, or abused, and particularly for the want of sufficient drink in warm weather, and the consequences will always be injurious. Sensible hostlers in large cities are awakening to the advantages of frequent watering. Street car horses are watered every hour, and sometimes oftener, while they are at work. It is plenty of water that supplies evaporation or perspiration and keeps down the temperature.

What old fogy methods amount to may be seen by the change in medical practice to man. Twenty years ago a person having a fever of any kind or pneumonia was allowed but little water to drink, and then it had to be tepid. To-day practitioners prescribe all the iced water the patient can possibly drink; and in addition, cold bandages are applied to reduce and control the temperature of the blood. What is applicable to man will never injure a horse. Use common sense and human feeling. Don't think it is a horse and capable of enduring any and all things. A driver who sits in his wagon and lashes his worn-out, half-curried, half-fed and half-watered team should never complain of any abuse he may receive from his master or employer, for he is lower in character, harder in sympathy and less noble than the brutes he is driving, and deserves, in the name of all that is human, the punishment of a criminal.—*The Chicago Clay Journal.*

TO remove peach stains from white table napkins without injuring the fabric, try Javelle water or weak solution of oxalic acid. Wash out thoroughly. It is well to follow Javelle water with a weak solution of sulphurous acid.

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RECENTLY PATENTED INVENTIONS.

Engineering.

BALANCED SLIDE VALVE. — Cyrus Eversol, Springfield, Mo. This invention provides an improvement in slide valves having supplementary valves which are held on their sides and control the inlet and exhaust ports of the cylinders. By this improvement runners are arranged in grooves in the bottom of the valve and sliding on the flat top surface of the cyliuder, whereby the valve is held clear of the surface, while the valves held in the sides of the slide have their outer surfaces inclined to fit on correspondingly shaped surfaces on the sides of the steam chest, centers being held on the slide for supporting the valves.

Railway Appliances.

STATION INDICATOR.—John A. Kane, Paterson, N. J. This is a device to place on railway cars to indicate the successive stations along the road, and consists of a casing in which is journaled a main shaft with radially extending arms adapted to be tripped by a station tripping device with which each station along the road is provided. The casing has a drum carrying a web bearing the names of the several stations, the names being severally exposed through a suitable opening in the case as the shaft is revolved. By an auxiliary operating mechanism the drum may be rotated at will in either direction.

SPRING RAIL FROGS.—Morton L. and Henry W. Byers, New Castle, Pa. A locking device, consisting of a simple and reliable attachment for an ordinary spring rail frog, is provided by this invention, to secure the spring rail against lateral movement until the frog is used to transfer cars from a side track to a main track, thereby avoiding the accidents liable to occur from non-support of the elastic rail of the frog. The device consists of a revolubly supported transverse rock shaft having a collar engaging the rigidly supported side rail of the frog, while a lug on the shaft is adapted to lock or release the spring rail when the shaft is rocked.

TRACK FOOT GUARD — Stephen R. Blizzard, Lincoln, Neb. This guard is designed to be placed in the wedge shaped spaces between the ends of railway frogs, and between guard rails and the main rails, and other places where a person's foot is liable to be caught. Combined with the rail frog, or the guard and the main rail, are rods passed through the rails and provided with rollers or washers and springs for pressing the rollers together, the rollers forming a barrier to the opening between the rails which will prevent the entering of a foot.

CAR COUPLING. — Thomas Courser, Lake City, Fla. This device is designed to be simple and durable in construction, self-coupling, and adapted to hold the free end of the link level to guide it easily into the opposing drawhead, and also to hold the link in a locked position to prevent accidental uncoupling. The coupling pin is preferably made in the shape of a plate having a hook on its lower end to engage the link, the front edge of the pin being rounded off, and having a rear notch to rest upon and hold the link in position, while a second rear notch is adapted to be engaged by a loop to hold the pin in a locked uppermost position. The device is adapted to be operated by a shaft having handles at its ends and extending across the end of the car.

CABLE CONDUIT COVER. — Harry Hughes, Abilene, Kansas. This is an improved covering for the conduits of cable-operated railways, by means of which the conduit will be opened by the pilot of the car, and automatically closed after the car has passed. The invention consists of a series of plates fitted to slide in angular bearings across the slot, and levers, each connected by a link with a plate, and extending in the path of the pilot at the next following plate. No springs are required to effect the movement of the plates, which is accomplished by direct and positive mechanism.

Mechanical Appliances.

SELF-ACTING MULE. — Robert Schneider, Biela, near Bielitz, Austria-Hungary. According to this invention the driving band is made to pass over a series of double grooved pulleys, of which two pulleys are loosely mounted on the spindle driving shaft, each adapted to be alternately engaged with or disengaged from the shaft. By means of this improvement the spindles may be rotated at the same speed either to the right or left, for spinning thread right or left hand as desired, and for double spinning by first spinning the material in one direction and then in the other, without changing the position of the driving belt on the several pulleys.

KNITTING MACHINE ATTACHMENT.—William Pearson, Salt Lake City, Utah. This invention relates to hoisery knitting machines, providing therefor an attachment whereby the hoisery can be readily made with double heels, double toes, and double knees. A circular cam rests on the machine table and is adjustable thereon around the carrier, there being also a vertically sliding frame or bracket carrying an auxiliary thread guide alongside of the carrier, whereby, by adjusting the cam, the auxiliary thread may be incorporated in different parts of the fabric, thus forming a double webbing to re-enforce the fabric where desired.

ENGINE LATHE TOOL HOLDER.—Karl J. Pihl, Brooklyn, N. Y. This device is designed to take the place of an ordinary tool post on an engine lathe slide rest, to efficiently retain the cutting tools in proper position to engage the work, and facilitate the quick adjustment of a tool or its release when desired. On the lathe slide is a base plate having a rectangular groove on its upper side, while a rotatable carrier having tool holding grooves has a projection on its lower face entering the groove of the base plate, a bolt projecting through the base and carrier, there being on the upper end of the bolt a recessed locking handle and washer. The device is designed to insure the proper retention in place of lathe tools for every character of work.

VULCANIZER. — James Fergus, Philadelphia, Pa. Two patents have been granted this inventor for improvements in vulcanizers. According to the first patent the stand or base has a ring removably attached thereto provided with an upper peripheral rib and an exteriorly threaded surface, in combination with a bowl the upper edge of which is carried outward and downward, forming an under groove adapted to receive the rib of the ring, and a threaded cap adapted to be screwed upon the ring, the ring being quickly and easily removed when desired, and expansion and contraction being amply provided for. By the second patent an improved construction is provided, with means for manipulating the cover and conveniently raising it any desired distance from the upper surface of the bowl. When the bowl has been placed in its support and the article to be vulcanized has been placed in it, the cover is readily forced downward with its gasket engaging so tightly the upper edge of the bowl as to provide an air and steam tight connection.

BUTTON FLY CUTTER.—Philo B. Clark, Brooklyn, N. Y. The cutting of button fly scallops for shoes is the especial purpose for which this machine has been devised. It is simple and durable in construction, and has two or more attached swing cutters, the machine being so arranged that the clamping head may be expeditiously adjusted to engage with and bind upon an anvil block a greater or less number of flies, including the pattern, and so that the anvil block may be reduced in thickness as its surface becomes worn, and then adjusted to a proper position to receive the flies.

SAW GIN. — Joseph A. Bachman, Austin, Texas. This gin is designed to separate the cotton into parts of different quality, being adapted to do a great amount of work, and occupying but little space. By the improved construction the upper roll box is especially adapted to raw cotton and the lower one to half ginned cotton, the lint and seeds being only partially separated in one roll box, when they are delivered into another, where the operation is completed. The saws and brushes are of the usual construction, and the saws project through grates into the roll boxes, which have top and bottom openings, the seeds dropping from the lower box, to which the half ginned cotton is delivered, in the usual manner.

Agricultural.

CORN PLANTER. — Edward B. Wells, New Castle, Ky. This is an improved implement of simple and economic construction, capable of being readily manipulated to register with the last check. Its design is such that means are provided whereby the check row markers may be conveniently and expeditiously rotated by hand, while the seed drop slides may be manipulated by hand to drop at any desired point in the path of the machine. The invention consists in the novel construction and combination of the several parts.

Miscellaneous.

HOISTING APPARATUS. — John Leach, Jersey City, N. J. According to this invention the shafting and drums of the hoisting apparatus are provided with connected channels and chambers, by which a free circulation of water may be maintained, to keep the outer surface of the drums cool at all times, the rope wound on the drums being thereby prevented from the possibility of injury by heat, from the friction of winding or unwinding.

WELL SINKING APPARATUS. — Alfred O. Hiscock, Wyoma, Fla. Combined with the drill is a series of sectional drill rods or tubes, the drill operating rope being attached at the top of the rods to hoisting cables, while one or more of the cables extends at the side of the drill rods to the drill itself. The tubular drill rod sections are made of steel and wood, that they may be of reduced weight to facilitate the sinking of wells to a great depth, while the cables connecting with the drill at the bottom enable them to be easily raised should there be a break in the rods. The hollow rods also may be used to supply water to the drill.

VEHICLE. — Henry Seeman, Durham, N. C. Spring bars are secured centrally and longitudinally on a pair of side bars, and from the ends of the spring bars are suspended cranked bars, parallel body supporting springs being mounted on the cranked bars. The improvement is designed to be particularly applicable to side bar buggies, making the running gears of such vehicles light and strong, while affording ample spring action and evenly distributing load, although dispensing with the use of metallic springs. The invention also provides an improved and simple fifth wheel attachment for the gears.

WHIFFLETREE HOOK. — Charles W. Blackburn, Tombstone, Arizona. According to this device the track hook has an inner arm arranged to slide in and out in a ferrule of novel construction on the end of the whiffletree, there being a pin and slot connection between the arm and the ferrule to lock the hook in its inner and outer positions, the free end of the other arm of the hook being adapted to enter a trace eye when the hook is slid outward, and lock the trace when the hook is slid inward. The improvement affords a simple construction designed to furnish a readily operated hook which will securely lock the trace against accidental displacement.

WAGON AXLE.—Daniel R. Van Allen, Chatham, Canada. According to this invention the axle skein is formed at its inner end with a head having a flat upper face with a transverse recess and a flat lower face having a longitudinal recess, the latter recess merging into an inward incline. The improvement is designed to remove the weight from the center of the axle to the skein, to prevent breakage by heavy loads or on sudden jars. A longitudinal truss rod extends from one head of the axle to the other, and by fastening the bolster to the axle in connection with the truss rod a solid truss is formed adapted to withstand great strain.

HAY PRESS. — E. Manuel Turner, Wilmington, Ohio. The case of this press is divided by a transverse partition to form a press box in one end, in which slides a follower having laterally extending ears moving in slots, toggle levers carrying pulleys at their joints being pivoted to the ears and to the main case. Cables secured to the sides of the case extend around the toggle levers, thence inward over guide pulleys and out through the front of the case, while a cable from the follower extends over pulleys through the partition and the side of the case. The press may be operated by hand or power, the method of applying the power being very simple and efficient, and the press being designed to work well and rapidly to make a bale at one motion.

BLIND FASTENING. — Oliver Adams, Larchmont, N. Y. This is a simple device for use in connection with the usual blind latch, and consists of a small bracket attached to the inner face of the blind near the hinge, and a bar with downwardly bent ends adapted to be placed in the eye of the latch bolt and the eye of the bracket when the blind is to be locked. One or more sockets are secured on the window sill, and the blind is held open in different positions by placing one end of the bar in one of the sockets and engaging its other end with the eye of the latch bolt.

ONION SLICER.—John F. A. Edwards, Bushire, Persia. This is a machine of simple and inexpensive construction for slicing, mincing, or crushing an onion or similar vegetable or fruit, to extract the juices therefrom and prevent the escape of any of the odors. It has a dished base to receive a saucer-like receptacle, and on the base is hinged a cylindrical vessel within which slides vertically a smaller cylinder carrying at its lower end a series of transversely arranged knives, the knives passing between the bows or staples of an inner wire cage within which the onions or other articles to be minced are placed.

SIEVE —Silas G. Cooper, Minneapolis, Minn. This is a simple device especially adapted for use as a fruit sieve or strainer in preparing fruits for making jellies, marmalades, etc. A removable strainer is placed in the lower small end of a tapering vessel, and a removable sieve above the strainer, while a removable shaft is mounted in bearings in the vessel and provided with blades or paddles working on the upper face of the sieve. When the fruit is placed in the vessel, and the paddles are revolved by a crank and handle, they crush the fruit and force it through the sieve upon the strainer, the juice being collected below in any suitable receptacle.

COIN HOLDER.—Franz Michl, New York City. This is a circular casing in which is a spring-pressed plunger, the upper end of the casing being closed by a flanged cap in one side of which is a slot, while a push slide is fitted close to the under side of the cap. The holder forms a simple device for pocket use, serving to conveniently hold coins of various denominations, the uppermost coin in the holder being always held in a position to be conveniently pushed out.

NEEDLE THREADER.—William H. Lighty, Monticello, Ind. This device has a spring pressed tapering cylinder arranged within a case, and spring tongues held within the cylinder are adapted to be extended from its tapering end and passed through the needle eye, when they open to receive the thread, which is drawn back by them through the eye by the operation of a spring within the case. The tongues are made of finely tempered steel, and operate as tweezers in pulling through the thread. This threader may be quickly and easily adjusted to a needle of any size, and it may be made in a style and form suitable to be worn as a charm on the watch chain.

JAR COVER AND CLAMP.—Frank H. Palmer, Brooklyn, N. Y. The jar has two external annular projections, one above the other, while the cover has an annular flange on the under side of which is held a packing ring seating itself on the upper projection of the jar. A bail held on the cover has downward arms and lugs extending through grooves in the lower projection and engaging its bottom. The construction is simple, yet the cover is securely held in place to render the jar air tight, while the displacement of the packing is prevented, and the can may be readily opened when desired without spoiling the packing.

BUTTON CLASP.—Francois X. Lamboley and Abraham Jacobson, New York City. This is a simple and practical device for attaching buttons to sealskin garments, though it may be used for other purposes. It consists of a U-shaped spring, the inner member of which on its inner face has a tubular loop-engaging post having a flange or lip, a catch on the outer member being adapted to be sprung under the lip by a torsional strain on the spring, while a fastening screw or pin is passed through the garment or fabric into the tubular post to secure the clasp in place.

CLASP KNIFE.—Rudolph C. Kruschke, Duluth, Minn. This knife is designed for the use of sportsmen, sailors, one-armed men, and others who frequently require a knife that can be operated by one hand. The construction is such that, by moving a sliding plate in one side of the handle, a lever is tilted to operate a spring by which the blade is thrown outward with sufficient force to engage a lug by which it will be held in open position. By another movement of the sliding plate in the handle the lug is released and the blade may be closed.

TRUNK STRAP AND FASTENING.—Joshua R. Brown, High Point, N. C. This strap is preferably formed of sheet steel, brass, or other metal, and has at one end a loop formed on a plate, a stud in the rear side of which engages a keyhole slot in the strap. At the opposite end of the strap is pivoted a hook, of such form as to give ample leverage when brought into engagement with the loop to tighten the strap on the trunk, the point of the hook being afterward engaged by a catch. The fastening is simple and inexpensive, and is designed to give great strength.

POULTRY KILLING.—George Emerson, Long Bottom, Ohio. This invention provides a device for retaining fowls while being slaughtered, consisting of a vertical tapered box having a longitudinal slot in its side, with a bridge piece extending across the slot. The fowl is dropped into the box, with its head held by the hand and carried along down outside of the slot, in position to be quickly and easily severed from the body.

WASHING MACHINE.—Nathan D. Killgore, Nickelsville, Va. The main frame of the machine has side uprights between which is supported a semi-cylindrical tub, an oscillating rubber pivoted in the frame extending into the tub. Above this rubber is mounted another rubber, which moves in slides, the the clothes being held between the two rubbers while being washed. The lower rubber is moved forward and backward by means of a handle, whereby the machine may be operated with great ease, the clothes being quickly and thoroughly washed in such a way that they are not likely to be injured.

EXHIBITOR.—William R. Garner, Galveston, Texas. An improved stand, intended especially for supporting a number of calculating tables or other sheets of information in convenient position for use, is provided by this invention. The sheets are held upon rollers of the curtain spring roller type in a casing held on an upright above a desk, in such position that the sheets may be drawn down as desired for use in commercial or other calculations.

TOY BANK.—John Murray, New York City. In addition to the receiving section of the bank, this invention provides a construction by which a series of figures are designed to move to and from this section. Means are also provided whereby one of the figures will act to deposit the money, the other figures approaching while this is being done. The special construction shown by the patent represents a colored boy trying to steel chickens from a hen coop, but a dog on one side and a man with an umbrella on the other side are starting for the boy.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention and date of this paper.

SCIENTIFIC AMERICAN BUILDING EDITION.

NOVEMBER NUMBER.—(No. 73.)

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2. Elegant plate in colors showing a residence in the Colonial style of architecture, recently erected for Mr. Gerald Hayward, at Larchmont Manor, New York. Floor plans, two perspective elevations, and interior view.
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6. Plans and elevation of an attractive dwelling at Asbury Park, N. J. Cost $4,300 complete.
7. A model cottage at Chester Hill, Mt. Vernon, N. Y. Floor plans and perspective view. Cost $4,000 complete.
8. Perspective and plans of a cottage at Fordham Heights, N. Y. Cost $5,800 complete.
9. A cottage recently erected at Asbury Park, N. J. Cost $2,700 complete. Floor plans and perspective.
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11. Perspective and ground plan for a memorial church.
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Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

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Minerals sent for examination should be distinctly marked or labeled.

(3626) J. C. R. asks: 1. How much bichromate of potash will saturate a gallon of water? A. 12·8 ounces avoirdupois. 2. After treating a black ink stain on linen with chlorine there remains a yellowish stain. What will remove it? A. After moistening and blotting off the spot apply weak oxalic acid. 3. What artificial light will answer all the purposes of sunlight in evening lecture room experiments, such as producing the solar spectrum, polarization, etc.? A. No artificial light will answer all the purposes of sunlight, the nearest approach to it is the arc electric light. 4. I am unable to charge my Leyden jar with my induction coil. What special precaution is it likely that I have omitted? A. To charge your jar you should place it upon an insulating stand, and arrange the terminals of the secondary coil so that one will discharge into the interior of the jar and the other into the outer coating. 5. In using a 6 inch emery wheel for grinding lathe tools what is the most advantageous speed? A. If the wheel is of a reliable make, it should run from 1800 to 2000 revolutions per minute. 6. What will remove printers' ink from linen? As it is mostly carbon, I think it cannot be susceptible to chemical bleaching influences. Am I rigbt? A. Printers' ink cannot be removed successfully from paper; benzine will soften it and remove it to some extent, and alcoholic solution of caustic potash will do the same. It is not a bleaching action, but a destruction of the vehicle carrying the carbon that is to be sought for. It cannot be bleached.

(3627) G. G. asks: What is the best method of building with brick and mortar during freezing weather? Should the mortar be heated, and will it dry out fast enough, so that the frost will not injure the wall?—How is the gas made which is used in inflating the toy rubber balloons, and where can the balloons be purchased? A. The heating of mortar will do in very moderate frosty weather. If there is convenience for warming the bricks also, it will help matters some. This method works fairly well when the day temperature is above freezing and the night temperature but slightly below freezing. Even then the tops of the walls should be protected by planks and bagging. The use of common brown sugar in mortar has been made, and not only shown great resistance to the disintegrating influence of frost, but made the mortar actually stronger than mortar made in the usual way. Mortar made with 2 pounds of coarse brown sugar to 1 bushel of lime and 2 bushels of good sharp sand has been found best suited for the purpose. Dissolve the sugar in water sufficient to make the mortar and add slowly to the slaked lime paste and mix with the sand. It is said that the sugared water increases the solvent qualities of the lime and that this accounts for its hard setting. The mortar should be mixed in small quantities and used quickly, as with cement.—Ordinary coal gas is used in toy balloons. It requires a small pump or gas holder that can be weighted after filling, to give pressure, as the gas house pressure is not sufficient for filling. The rubber houses furnish the balloons. They require to be varnished after filling with a thin mastic varnish in alcohol, to keep the gas from passing through the rubber.

(3628) J. B. McK. says: I have been making a black polish for leather of gum shellac, alcohol and lamp black, but to get a good polish the liquid has to be made too thick. Can you inform me of something to add which will give the desired luster, also is there anything which can be added which will lessen the cost of production?—What articles, and in what proportion, are put in buckwheat flour to make self-raising? A. Pure asphalt added to your varnish will help the polish and be cheap, but for a fine polish black japan varnish (air drying) is the proper thing.—For baking powder use 9 parts bicarbonate of soda and 8 parts of tartaric acid by weight. Mix thoroughly, dry and pulverize with 10 parts ground orris root, or rice flour, or the buckwheat flour that has been thoroughly dried. Add ½ to ¾ of an ounce of the powder to one pound of buckwheat flour, more or less, which you must find best with your quality of flour.

(3629) J. F. C. says: My object in writing to you is as follows: I am a member of the high school of this town, and in a recent discussion on the term horse power, one scholar said the term was derived from a horse, saying a horse could lift 33,000 pounds one foot from the ground. I said that the term horse power had nothing whatever to do with a horse; moreover, a good draught horse could not lift 33 000 pounds one foot from the ground. A. The term horse power was derived from the power of a horse, as established by James Watt, who found by experiment that the average mill horse could lift 150 pounds, when attached to a rope over a pulley, at the continuous speed of 220 feet per minute or 2½ miles per hour: 150 ×220=33,000 pounds lifted one foot per minute. This has since been verified in England by an average on the continued day work of 144 horses used in plowing, when the average work was found to be 163 pounds lifted 220 feet per minute, or at the rate of 2½ miles per hour. This somewhat exceeded Watts' assignment of the horse power of work.

(3630) R. A. writes: 1. Please give a description of the simplest and most efficient form of Barlow wheel? A. The simple smooth-edged wheel or disk is as good as any with mercury tangential contact, and with the field pieces close together and of large facing area. This gives the lowest possible reluctance to the magnetic circuit. 2. How is the silver plate used for the cathode of Smee's battery platinized? A. The surface of the plate is roughened by nitric acid, and the platinum is deposited by electro-deposition. 3. Will copper plated with silver and then platinized answer this purpose, or is solid silver necessary? A. A good heavily silver-plated copper plate will answer. 4. Can a silver-plating solution be made by taking the proper proportion of cyanide and water and allowing a plate of silver to stay in the solution until enough is dissolved? A. Not satisfactorily. For the removal of your mercury stain you might try a hot iron.

(3631) C. A. M. asks: 1. What are the chemical changes that occur in exposing a blue print made from a bichromate of potash and ammonio-citrate of iron solution? A. The ordinary blue print reaction, namely, reduction of a ferric iron salt to the ferrous state, takes place and is accompanied by the rendering insoluble by the action of light of the bichromatized sizing of the paper. 2. Give directions for making a small photographic camera for five by eight plate. A. The SCIENTIFIC AMERICAN, vol. 59, No. 21, contains a description of a simple camera.

(3632) M. B. R. asks: Does the crosshead of a horizontal engine make a stop at the ends of the slide, while the crank is in motion, say when the crank passes dead center? A. Yes, the crosshead stops at the end of each stroke. The time may be infinitely small, yet it must stop in order to take up its return stroke.

(3633) J. S. McG. asks: Is the burning of natural gas in a public assembly room in a stove with no connections with chimney injurious to health? How do the deleterious results (if any) compare with the burning of hard coal in a similar way? A. The burning of natural gas in a public assembly room, especially if filled with people, is highly deleterious to health. Possibly not so much so as the burning of hard coal without chimney connection, which should not be tolerated under any circumstances.

(3634) P. B. asks if there is any kind of a cement I can use that will join together pieces of porcelain, that will hold together in a high degree of steam heat, say 300° or thereabout, and not part. A. For a porcelain cement to stand heat: Mix very finely ground glass 10 parts, ground fluor spar 20 parts, with a saturated solution of water glass 60 parts. Mix quickly and apply the paste to the joints. Will harden in a few days.

(3635) F. H. F. writes: Give me a recipe for polishing the wooden casement of an electric push button in a tumbling barrel in quantities of eight to ten thousand at one time. A. If there are no recesses in the part to be polished, tumbling in ground pumice stone and then in sawdust will make a tolerable polish.

(3636) W. G. H. asks which of the two following words is the more correct to use—aluminum or aluminium. A. Either is correct. The first named is the shorter and to that extent preferable. The new metals generally have names ending in "ium"; hence a preference for "aluminium" is often expressed.

(3637) C. M. H. asks for a solution that will render cardboard fireproof. A. Sodium tungstate or sodium phosphate are good anticombustible agents. Use in aqueous solution. A little glycerine may be added, but this will tend to keep the object moist.

(3638) H. A. A. asks for a solution or dip to produce terra cotta color on brass goods. A. Dip the clean brass in a solution of 16 drachms nitrate of iron, 16 drachms hyposulphite of soda, in 1 pint of water, until the desired color is obtained.

(3639) E. K. J. asks: In steering a boat is it not the stern which is first moved before the course is communicated (inversely) to the bow, or is the bow the first to be affected by the action of the rudder. Would it be correct to assume that the steering of a boat is conducted upon the principle of the lever, holding the rudder to be the lever, the water the fulcrum, and the headway of the boat the applied power. A. The rudder acts as a lever as you suggest and throws the stern from the line of the course, but the boat swings on its center of gravity; the bow swinging in the opposite direction from stern, from the moment the rudder is thrown out of line. Of course there are exceptions, as with sailing vessels when the sails are not balanced, or with propellers, which have a side thrust which has to be steered against.

(3640) W. G. asks: 1. What is the method to manufacture peroxide of hydrogen, if any other than by the action of aqueous acid solution on peroxide of barium? And what acid is the best for its manufacture? A. This method is the one to be recommended: Use dilute sulphuric acid, at least 5 parts of water to 1 part of acid. 2. A clearer method to obtain it of certain number of volumes at will; for instance I wish to make three solutions of say 10, 15, and 20 volumes respectively. A. 168·8 parts of pure peroxide of barium will give 34 parts of binoxide of hydrogen, using 98 parts of sulphuric acid. But as the commercial article is never pure, it should be analyzed. On these figures you can base the strength, remembering that it becomes more explosive with concentration. 3. How long will these solutions last in good order if carefully bottled and stoppered, for future use? A. No definite answer can be given. Dilute solutions, if the corks are wired in, will last a long time.

(3641) N. C. Y. asks: 1. What are the best ways of testing impure water besides the permanganate test and analysis? A. Bacterial examination, with microscopic determinations of the organisms found. 2. The best method to obtain the nickel in a pure state from alloys of the metal. A. Dissolve in hot hydrochloric acid, to which from time to time a little nitric acid is added. Boil when dissolved to expel all free chlorine or nitrogen oxides, cool, add a small excess of hydrochloric acid, and precipitate the copper with sulphureted hydrogen. Filter, and separate the nickel from the filtrate by precipitation with potassium hydrate solution and reduce with hydrogen at a red heat. 3. Is a common analyzing chemist's work injurious to health if carried on in a ventilated laboratory? A. Not unless the person is very sensitive.

(3642) G. B. B. asks for a filling to resemble ivory that would hold very firm and be hard and durable to fill in a chipped ivory billiard ball, also composition balls. A. For a cement for cracks in billiard balls, melt white wax resin and turpentine equal parts and mix dry colored paints, to match for color; use zinc white for white, vermilion for red, smalts blue, etc. Crowd the melted paste into the cracks. It will be ready for use as soon as cold. If a piece is chipped off the outside, it must be plugged with ivory, using the cement for holding it.

(3643) W. W. H. asks: Which is the oldest, also which is the latest metal in the world? Also where and when was gold first mined? A. Gold was probably the first metal discovered and used. It was mined in Egypt and well known in the eastern empires 1800 years B. C. It was probably known and used in India many hundred years before this period. The latest metal is assyme, derived from the metal tine. Melts at 429° Fah., and has some of the peculiar qualities of tin.

(3644) F. B. asks the best method of obtaining superheated steam from boilers. We run our boilers at eighty pounds pressure and desire to take steam from the boilers to a grain drier, conveying it some little distance through pipes. In the grain driers we desire to use superheated steam; please inform us the best method to obtain it in this condition. A. For superheating steam it will be necessary to have a separate furnace so built that the amount of superheating can be controlled. For this purpose a cast or wrought iron pipe coil of the proper size to give an easy flow of steam through it, corresponding with the size of the steam pipe, say 75 feet of pipe in the coil, which should be put in a brick chamber and not in immediate contact with the fire. See Carvalho's system of superheating steam in SCIENTIFIC AMERICAN SUPPLEMENT, No. 112, illustrated. Also No. 372 on the economy of superheated steam.

(3645) C. C. N. asks: What two metals will produce an electric current when acted upon by heat? A. Brass and German silver or iron and an alloy consisting of antimony 2 parts, zinc 1 part. A pair of plates of almost any dissimilar metals will generate a current. 2. What degree of heat is required to generate the electric current? A. A current will be generated whenever there is a difference in temperature of the ends of the element. 3. In what manner must the metals be brought into contact to produce the desired result? A. The metals are joined by soldering.

(3646) D. L. W. asks: If a thin metallic disk, supported at the rim, be sprung from a plane surface by pressure at the center, would it take a parabolic form, or what form would it acquire? Would such a surface be near enough perfect for the mirror of a reflecting telescope? Can you refer me to SCIENTIFIC AMERICAN SUPPLEMENT containing information in regard to reflecting telescopes? A. A rule for calculating the size of cone pulleys. For example, in a foot lathe the pulleys on the head spindle are 3 inches, 4½ inches, and 6 inches in diameter respectively, and the largest driving pulley is 2 feet in diameter; what should be the sizes of the other two driving pulleys? A. The form of the plate would be approximately parabolic, but would be worthless for a telescope mirror. See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 581, 582, 583, for making refracting and reflecting telescopes. The formulas for matched cone pulleys are somewhat complex. You will find them complete in Cromwell's book on belts and pulleys, $2 mailed.

(3647) L. B. asks for a good polish for furniture, pianos, and woodwork and that would dry quick. A. Raw linseed oil 10 ounces, shellac varnish and wood alcohol 5 ounces of each. Mix by shaking before use. For pianos rub with nothing but a mixture of olive oil and water made on the palm of the hand and rubbed on with the hand alone.

(3648) W. H. B. asks (1) for a description of the battery used with electric light for necktie pin. A. The battery generally used is formed of carbon and amalgamated zinc, one rod of each to each cell. The bichromate solution is used. A small storage battery is undoubtedly preferable to the bichromate. 2. How many batteries will it need to run a four-candle light of ten volts? A. It will require at least six cells to run a lamp of this size. Much smaller lamps are used for the purpose, say ½ to 1 candle power, requiring 1 to 2 cells of battery.

(3649) T. M.—You will find the method of laying out curved sectional elbows in Butt's "Tinman's Manual." Price $1.25 mailed.

(3650) C. G. C.—For freezing mixtures see our SUPPLEMENT, Nos. 89, 352, 551, 608, and 646.

(3651) F. C. B. asks if it is injurious to health to have plants in a bed room. A. It has been said that the soil of potted plants breeds malaria. We cannot vouch for the truth of the statement.

(3652) T. M. D. asks: 1. Can white dextrine be held in mucilage form? If so, how? In all the experiments I have tried it goes back to a chalk white paste. A. It can. It should remain in solution in water. Try the following mixture. Dextrine, 2 parts; acetic acid, 1 part; water, 5 parts; alcohol, 2 parts. 2. What, except gum arabic, will make a light colored mucilage that will dry quickly and not be very costly? A. The above formula answers your requirements. 3. What dyeing material will make a jet black in liquid shoe dressing where shellac is the material used to give a polish? Is there anything that can be added to nigrosine, diamond slate dye, or any of the coloring matters that give a bluish or purplish appearance when applied to paper, that will give a jet black appearance after drying on soiled leather? A. Try to destroy the blue shade by addition of some brown dye. One formula recommends for shellac blacking, 21 parts blue aniline to 31 parts Bismarck brown aniline. 4. Please give formula for a good black ink (writing fluid) that will not be very expensive. A. The formulæ are very numerous. The following is typical: Dissolve as far as possible 18 parts pulverized gall nuts in 100 parts of water; filter through a cloth and dissolve in the filtrate 7 parts gum arabic; then add a solution of 7 parts of copperas in 50 parts of water.

(3653) B. R. W. asks: Will you please give formula and directions for making the prisms similar to those used in the Gonda form of Leclanche cell? Can the old prisms be revived and made nearly as good as new, and how can this be done? A. An old battery prism is of no value whatever; it should be replaced by a new one. The composition of the prism is as follows: granulated black oxide of manganese, 40 parts; granulated carbon, 52 parts; gum shellac, 5 parts; potassium bisulphate, 3 parts. These ingredients are mixed, heated to 212° Fah., and pressed in moulds under a pressure of two tons.

(3654) C. U. B. writes: 1. I send a sample of what we call carbon, which collects in furnaces from natural gas. What I want to know is, can this be used for a carbon battery? If it can be used, please tell me how. A. Yes. Grind to a powder, mix with enough sugar solution (thick sirup) to give it the consistency of clay, and heat to redness in an iron mould. After ignition and thorough cooling without exposure to the air they may be dipped again and ignited as before. It is well to boil in the sirup the second time. The last operations may be repeated until sufficient density is obtained. See "Experimental Science," or consult the SCIENTIFIC AMERICAN, vol. 60, No. 20. 2. Give me a receipt for cutting down plate glass and polishing it for making a telescope lens. A. See, for full and practical instructions, "Experimental Science," $4; or our SUPPLEMENT, No. 318. 3. What would be a good book on electricity for an amateur? A. "Experimental Science" contains much that is useful. Thompson's "Elementary Lessons in Electricity and Magnetism," price $1.25. Prof. Ayrton's "Practical Electricity," price $2.50.

(3655) H. K. S. asks (1) for the composition of Ashberry metal. A. Ashberry metal is composed of 78 to 82 parts of tin, 16 to 20 parts of antimony, and 2 or 3 parts of copper. 2. The composition of packfong. A. Packfong is made from 45 parts of copper, 21 parts of zinc, and 33 parts of nickel. From "Scientific American Cyclopedia of Receipts, Notes and Queries." In press.

(3656) L. J. F. asks for a ginger beer powder. A. Ginger, bruised, ½ oz.; cream of tartar, ¾ oz.; essence of lemon, 4 drops. Mix. Some sugar may be added if it be thought desirable to make the packet look bigger. For use this powder is to be added to a gallon of boiling water, in which dissolve 1 lb. of lump sugar, and when the mixture is nearly cool, two or three tablespoonfuls of yeast are to be added. The mixture should be set aside to work for four days, when it may be strained and bottled.

(3657) G. W. W. asks: What is the general method of working amber? A. Amber in the rough is first split and cut rudely into the shape required by a leaden wheel worked with emery powder, or by a bow saw having a wire for the blade; tripoli

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or emery powder being used with it. The roughly formed pieces are then smoothed with a piece of whetstone and water. The polishing is effected by friction with whiting and water, and finally with a little olive oil laid on and well rubbed with a piece of flannel until the polish is complete. In this process the amber becomes hot and highly electrical; as soon as this happens, it must be laid aside to recover itself before the polishing is continued, otherwise the article will be apt to fly into pieces.

(3658) H. D. G. writes: Suppose I have twenty sulphate of copper cells of battery connected in series to charge ten secondary cells, such as are described in SCIENTIFIC AMERICAN, vol. 62, No. 10; the secondary cells being charged. How many six-candle power lamps could be lighted, wired in parallel, by switching, independent of each other, both the gravity and storage battery into the lamp circuit? A. To charge 10 cells of storage battery simultaneously will require 40 cells of gravity battery. The gravity battery cannot be used in connection with the storage battery for operating lamps. Its resistance is too great and it yields only a comparatively small current. Ten cells of storage battery should operate from fifteen to twenty six-candle power lamps.

(3659) T. R. writes: I want to build a cistern for drinking water. Can you tell me what will keep the water from tasting of the cement the first year? A. If you use genuine Portland cement, you will not be troubled with the limy taste except for a short time after the cistern is built.

(3660) W. E. B. asks how fire eaters perform their feats. A. The old method was to place a bit of lamp wick soaked in solution of potassium nitrate and dried in a ball of oakum. The wick was lighted before placing in the oakum. This was taken into the mouth. If blown through, it produced the fire eater's appearance. When the mouth was closed, the appearance of fire ceased, but the wick remained ignited. On again blowing air out through the mouth, the fire eating again was produced. The present system is to take a wad of cotton dipped into benzine in the mouth. On blowing out through the mouth, the mixture of benzine vapor and air can be ignited, producing a flame six inches long. A tube or funnel can be used to blow through, but if properly done it is not necessary.

Replies to Enquiries.

The following replies relate to enquiries recently published in SCIENTIFIC AMERICAN, and to the number therein given:

Referring to query No. 3541, a very simple and effectual method of cleaning the bones of small animals is to put them near an ant hill, and in a day or two the ants will have removed every trace of flesh and will even polish the bones. Care must be taken that they do not remove small parts. I once obtained the bones in the head of a rattlesnake in perfect order by these means.

TO INVENTORS.

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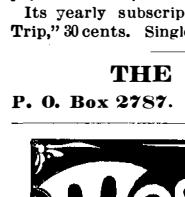

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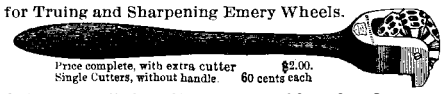

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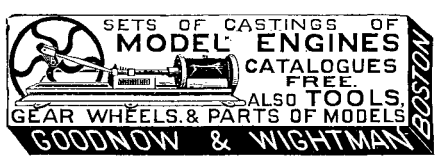

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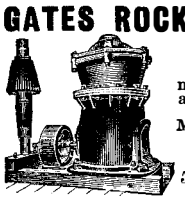

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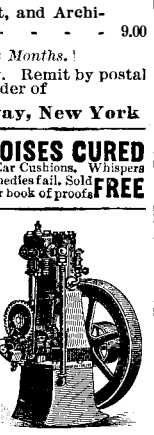

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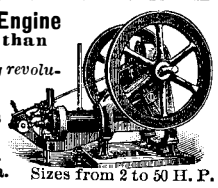

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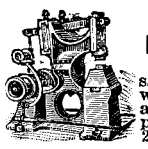

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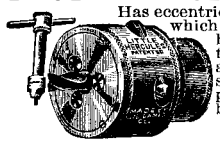

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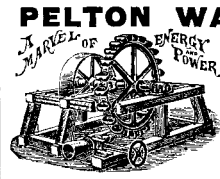

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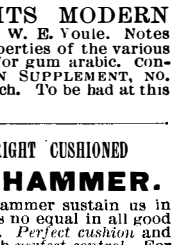

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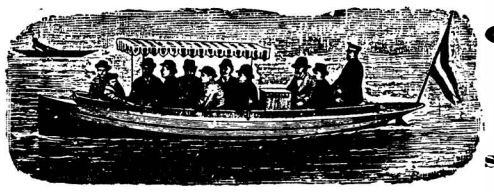

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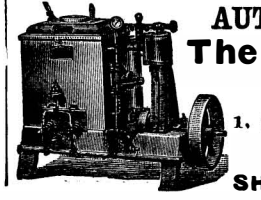

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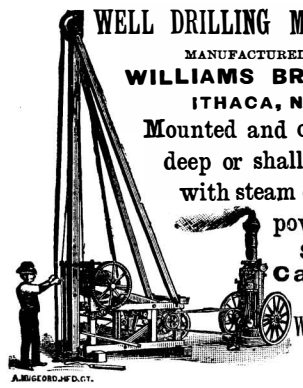

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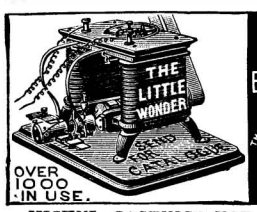

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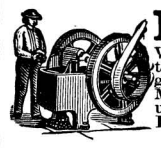

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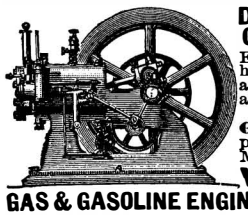

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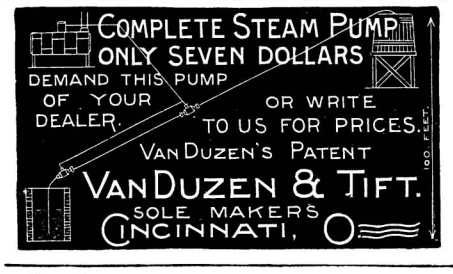

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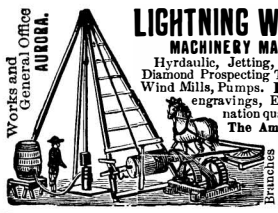

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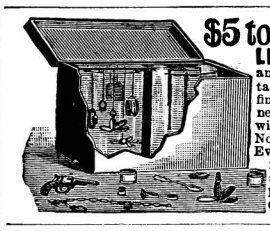

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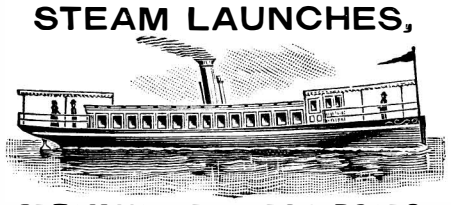

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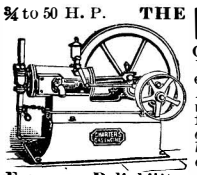

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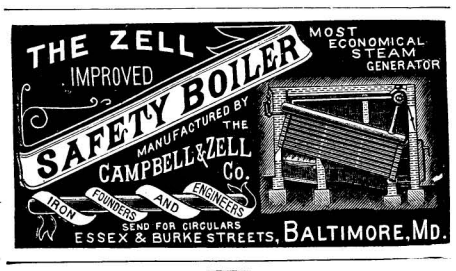
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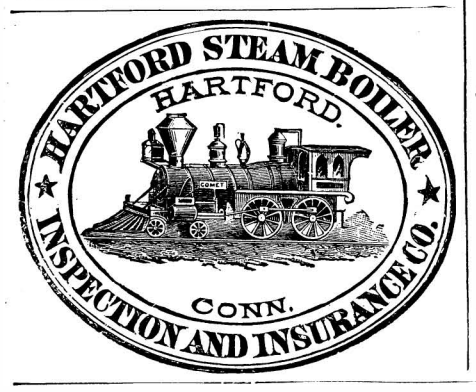

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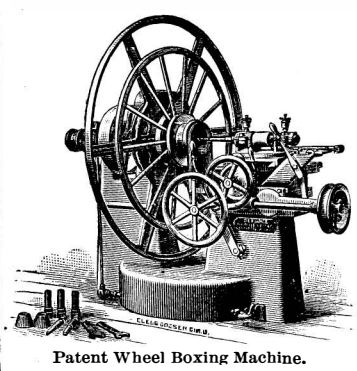

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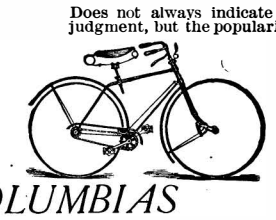

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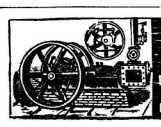

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